Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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Commercial Fisheries Abstracts

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0	General and theoretical	5	Vitamins
1	Fish by species	6	Fishery byproducts
2	Fresh fish	7	Analytical Methods
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Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.33 THE ROLE OF DEHYDROASCORBIC AND DEHYDROREDUCTIC ACIDS IN THE BROWNING REACTION

Dulkin, S. I. and Friedemann, T. E. (Northwestern University Medical School, Chicago, Illinois)
Food Research 21, 519-527 (September-October 1956)

A study was made to elucidate the role of ascorbic acid and reductic acid in the browning reaction. Reductic acid was included in this study because of its similarity, both chemically and physically, to ascorbic acid and because of its inclusion in "apparent ascorbic acid" compounds in heat-processed or stored foods.

Experimental.--The reductic acid used was prepared by the acid hydrolysis of citrus pectin, and is essentially that described by Reichstein and Oppenauer (1933). Purification was accomplished by recrystallization from ethyl alcohol-acetone (2:1) mixtures. The ascorbic acid employed was a U. S. P. grade of fine crystals.

Dehydro derivatives of both reductic and ascorbic acids were prepared by bromine oxidation. The bromine was slowly added to solutions of these compounds in N/100 HCl, drop by drop, while agitating the solution with a stream of washed nitrogen. The bromine addition was continued until a slight excess was indicated by the solution turning a light yellow color. Aeration was continued to remove the excess bromine.

Results and discussion.--The authors demonstrated that both reductic and ascorbic acids in acid or buffered solutions undergo a type of browning reaction analogous to that occurring in stored or heat-processed foods. The reaction is characterized by an increase in reducing properties, color, acidity, and fluorescence. They also demonstrated that, in both cases, oxidation of reductic and ascorbic acids

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 ABSTRACTER: Martin Heerdt

2.1121 DANISH-SEINING EXPLORATIONS IN NEWFOUNDLAND AND CAPE BRETON AREAS

Stewart, T. N. (Fisheries Research Board of Canada Biological Station, St. John's, Newfoundland)
Fisheries Research Board of Canada Bulletin No. 108, 26 pp. (1956) (Ottawa)

Appendix I. Method of Danish Seining on the Matthews II.

Equipment: anchor with 300 fathoms of cable; buoy consisting of two oil drums lashed about 1 fathom apart and a spot buoy attached; three canvas buoys, one of which has a longer rope than the others, the rope ending at a C-link; rope, eighteen 120-fathom coils $2\frac{1}{4}$ inches circumference rope, nine coils being spliced together with short splices to form each warp; net, commercial net in use is 30 fathoms across the wings, has glass floats on the head rope and leads on the foot rope. Lengths of chain were attached to the extremities of the wings; fairleads; and winch and coiler.

Setting.--The anchor is run out; the oil drums and spot buoy are attached to the anchor cable to take the weight. Two of the three canvas buoys are attached to the cable, the one with the C-link being near the end of the cable. The warp is attached by a C-link to the link of this canvas buoy. The third buoy is attached to the warp.

The warp is held at first so that the anchor cable is stretched in the direction in which the tide is running, then released and the first leg of the set made. Six and a half coils of rope are run out more or less with the tide; but the direction is modified so that, when hauling, the boat will be head-on to the wind. The course is then changed 120° to bring the second leg across the tide and the remaining two and a half coils are shot.

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0.7 THE PEPSIN-DIGEST-RESIDUE (PDR) AMINO ACID INDEX OF NET PROTEIN UTILIZATION

Sheffner, A. Leonard; Eckfeldt, Gladys A.; and Spector, Harry (Nutrition Branch, Quartermaster Food and Container Institute for the Armed Forces, Chicago, Illinois)
The Journal of Nutrition 60, 105-120 (September 10, 1956)

Cystine, tyrosine, and histidine plus the eight amino acids essential to human nutrition are used to calculate the PDR index when a protein is evaluated for the growing rat. Concentrations of each of these 11 amino acids in whole egg and in casein are determined both in pepsin digests and in completely hydrolyzed proteins. Each amino acid concentration value (milligrams per gram of protein) microbiologically available in the pepsin digest is subtracted from the concentration of the respective amino acid in the total hydrolysate to give the "residue" fraction.

Each amino acid is then expressed as a percentage of the sum of the 11 amino acids in the pepsin digest and in the residue fractions, respectively. For example, if the "free" histidine content of the pepsin digest of whole egg is 0.45 milligrams and the sum of the 11 amino acids in the pepsin digest is 163.5 milligrams, then histidine is 0.45/163.5 or 0.28 percent of the sum of these 11 amino acids.

The percentage of each amino acid in the pepsin digest of casein and the percentage of that amino acid in the pepsin digest of whole egg is then expressed as a ratio. These ratios are called egg ratios. A geometric mean of these egg ratios is then computed logarithmically by averaging the logarithms of the egg ratios, and obtaining the antilogarithm. A similar computation is made for the residue fraction.

The geometric means of the two fractions are each multiplied by a factor to correct for the degree of proteolysis of the test protein in comparison to that of whole egg protein. The factor for the pepsin

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 ABSTRACTER: Martin Heerdt

2.113 CATHODIC PROTECTION

Duff, M. G.
World Fishing 5, 40-42 (October 1956)

A vast amount of corrosion on land and sea is due to galvanic couples formed between metallic parts at differing electrical potential and in electrical connection. Corrosion in seawater is an electrochemical process essentially connected with the generation of small but measurable electric currents passing between metal parts at differing electrical potential. That part of the metal which corrodes forms one side of a corrosion cell and is called the anode or anodic area; the other pole of the cell is called the cathode or cathodic area. The cathodic area does not waste--it is in fact positively protected. For every rust point that forms on the hull of a vessel there is somewhere another point that is the cathode of that cell.

Cathode protection inhibits the action of the corrosion cells by reversing the flow of current at the anodic spots over the whole of a structure. This is done by superimposing a more powerful cell overall that takes over the activity of the many small cells and makes the whole underwater hull of a steel ship become one large cathode.

In practice this may be achieved in two ways: (a) by attaching an anode of an inert material to the structure and feeding a suitable amount of current to that structure to achieve the desired results. Anodes of this type do not waste, or waste very slowly. This system is dependent upon an external source of electricity, that may come either from the ship's generators or, for laid up vessels, from shore power. This method of cathodic protection is suitable for large structures near the shore, laid-up ships, and large active ships where power and maintenance personnel are continually available; (b) by attaching to the structure an anode of metal that is sufficiently lower in the electropotential

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 ABSTRACTER: Kathryn L. Osterhaug

DEHYDROASCORBIC ACID IN BROWNING

INDEX OF PROTEIN UTILIZATION

USE OF DANISH SEINE

CATHODIC HULL PROTECTION

0.7 (Cross Reference: 6.190, 7.52)

digest is the sum of the concentrations (milligrams per gram) of the 11 individual amino acids in the pepsin digest of the test protein divided by the sum of the concentrations in whole egg.

To obtain an amino acid index for the whole protein (casein) the corrected geometric means of the pepsin digest fraction and the residue fraction must be weighted according to the percentage of the total whole egg protein that each represents. The concentrations of the 11 amino acids measured in the pepsin digest of the whole egg protein represented, on the average, 31.5 percent of these amino acids in whole egg protein, and the amino acids in the residue represented 68.5 percent of the 11 amino acids in whole egg protein. The corrected geometric means are weighted and averaged geometrically to obtain the PDR index for the whole protein.

Results.--Microbiologically available essential amino acids present in enzymatic digests and in complete hydrolysates of whole egg and casein show large differences in the proportions of amino acids liberated from the two proteins by pepsin digestion. These differences are considerably reduced if digestion is continued by treatment with trypsin, or trypsin and erepsin.

If whole egg protein is the standard, then the total essential amino acid patterns in proteins can be compared by computing "egg ratios". The integrated essential amino acid egg ratios are calculated according to the method of Oser (1951), as modified by Mitchell (1954) to include tyrosine but omit arginine in computing the revised index (modified essential amino acid index, MEAA). With many proteins, the total amino acid index overestimates their biological value. This fact supports the hypothesis that much of the potential nutritional value of many proteins is lost by the release and absorption of disproportionate amounts of essential amino acids at an early stage in digestion. As a consequence, a new amino acid index was devised to take into account the physiological availability of amino acids during digestion. The newly devised PDR amino acid index combines the pattern of essential amino acids obtained from analysis of the pepsin digest with the amino acid pattern of the remainder of the protein to produce an integrated index.

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to the respective dehydro compound is a prerequisite to browning. In the case of the dehydroreductic acid, the reducing substances formed were identified as reductic acid by spectrophotometric analysis. The authors suggested that as dehydroreductic acid is reduced to reductic acid, a simultaneous oxidation occurs which is accompanied by the formation of brown resins, acidic substances, among these probably α-ketoglutaric acid, and other products so far not identified. They also proposed reaction equations for the chemical reactions which occur during the browning of dehydroreductic acid, and the browning of dehydroascorbic acid solutions, both of which are similar.

The degree and rate of browning in a solution of dehydroascorbic acid is very much less than that occurring in a corresponding solution of dehydroreductic acid. This may be due to the fact that dehydroascorbic acid must first undergo an irreversible transformation to 2,3-diketogulonic acid. This transformation was first postulated by Herbert et al. (1933) and was substantiated by the work of Penney and Zilva (1943), who studied this reaction under conditions almost identical to those of this investigation. The latter investigators referred to the reaction as a mutarotation.

The rate or intensity of the browning of either dehydroreductic or dehydroascorbic acids is not increased by the addition of an amino acid. Thus, the browning is not identical to the Maillard-type of reaction.

It is suggested that the type of browning described above may be one of several mechanisms involved in the browning of foods, especially fruits, since these foods are high in ascorbic acid and may contain reductic acid derived from pectin. Actually, more than one mechanism may be involved at the same time; however, understanding the types of reactions involved may lead to a better means of control with a resultant increase in the acceptability and/or nutritional quality of foods, and to an actual savings in money as a result of decreasing the losses due to the browning reaction.

2.113

series than the metals to be protected to give a cell between the anode and structure that is powerful enough to produce the necessary current. Such a cell generates its own power. The anode is consumed slowly--the structure is protected at the expense of the anode, which is, however, replaceable. This method is of particular interest for application to fishing vessels of all kinds as well as to other classes of small boats.

Cathodic protection of vessels permits less expensive construction, promotes economy of operation, and reduces maintenance costs through the following considerations: (a) reduction in repair expenditure; (b) reduction in time in dock or on slipway; and (c) no rust or scale formation on the underwater hull.

Although cathodic protection means more to steel than to wooden vessels, it is by no means inapplicable to the latter. Cathodic protection for boats means the preservation of metals below water, and the metal gear on a wooden vessel can be as well protected as the whole hull of a steel ship. Special cathodic protection techniques have been developed for the protection of stern and rudder gear on wooden vessels. They are simple to apply and well worth while.

2.1121 (Cross Reference: 2.1125)

The net is placed on the stern with the mouth facing forward and the left wing on the port side. The end of the first warp is connected to the right wing and the net is shot right wing first, then the bag and lastly the left wing. The boat is slowed while the net is being shot, and the second warp, attached by a C-link, is held so that the wings are stretched to their full extent.

Two and a half coils of the second warp are laid out in the same direction, and then a second turn of about 120° is made to return to the buoy.

A grapnel is used to pick up the warp between the second and third buoys. The end of the anchor cable is secured by a hook on the bow, while the ends of the two warps are led through fairleads to the winch and coiler.

Hauling.--The ropes may be hauled over either side of the boat, or in good weather over the stern, but are usually hauled from the windward side. The coils formed on the deck under the coiler are removed periodically and arranged on deck in preparation for the next set.

Hauling is in three phases.--At first, for a period lasting about an hour, the rope is hauled slowly; during this time the net remains stationary on the bottom and the warps are straightened out.

At the end of this time the ropes come in more easily and the speed of hauling is increased. The net is moved over the bottom; the length of time depends on the speed and force of the tide, which, when it is strong, tends to lift the net. The usual duration is 20 to 25 minutes.

When the net rises clear of the bottom the wings come together; this can be seen on the boat as the ropes are now coming in side by side. The forward rope is now passed through the after fairlead in addition to the forward one, and the haul is completed as quickly as possible, the tension on the two ropes being kept equal. If one becomes more taut than the other, it is slackened off for a few moments.

When the net is brought up, the wings and mouth of the bag are hauled by hand over the stern. The bag is hoisted in by means of a gilson.

2.114 PROPELLERS FOR FISHING BOATS

Traung, Jan-Olof (Fishing Boat Section, FAO, Rome Italy)
Canadian Fisherman 43, 20 (August 1956)

Selection of the proper propeller for a fishing boat should not be difficult because of the large amount of practical research data in existence. In spite of this, many boats are equipped with unsuitable propellers having a low efficiency. This may be blamed in part on the incorrect estimation of speed. If a fisherman tells an engine or propeller manufacturer that his boat is able to run 2 knots faster than it can, his new propeller will be of the wrong dimensions--too high in pitch--with the result that he cannot run his engine at full r.p.m. and is unable to use the full output of the engine.

Because of the difficulty in determining speeds and because fishing boats travel at different speeds under varying weather conditions and when dragging fishing gear, the use of controllable pitch propellers is recommended. In some countries, such as Scandinavia, controllable pitch propellers are almost exclusively used in fishing boats, but in most other parts of the world there seems to be ignorance of their possibilities or fear that they would add mechanical complications requiring high maintenance costs. This is probably due to the fact that some novel designs of controllable pitch propellers have been too complicated and have not been perfected. Those used in Scandinavia are of very simple design. No reverse gear is needed when a controllable pitch propeller is used, and boat maneuverability is also improved.

The use of a shrouded propeller, the so-called Kort nozzle, has many advantages, especially for trawlers. It increases the pull during trawling (normally by some 25 percent), protects the propeller from the trawl wires and, with modern Kort nozzle rudders, the boats have excellent maneuverability. Tests with Kort nozzles on trawlers have proved that these boats pitch less in a seaway and can therefore travel at higher average speeds.

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 ABSTRACTER: Kathryn L. Osterhaug

2.116 GERMANS DEVELOP NEW DEPTH FINDER FOR MIDWATER TRAWL FISHERMEN

Anonymous
Western Fisheries 53, 26 (October 1956)

A new type of depth finder designed to determine the movement of midwater trawls has been developed in West Germany. Sound signals, rather than frequency modulation, is used to indicate the depth at which the net is moving.

The new device was developed by the German Federal Fish Research Institute in cooperation with commercial firms in Bremen and Hamburg. It uses the same principal as a somewhat similar device developed by the Fish and Wildlife Service at Miami. The new depth finder consists of a conventional pressure meter attached to the ground rope of the trawl net. It measures the depth position of the net. These measurements are electrically transformed into sound signals and transmitted to the fishing vessel.

Instead of using frequency modulation to indicate the depth of the net, as does the United States device, the German apparatus uses groups of intermittent sound signals for various depths. The oscillator emits uniform signals of a steady frequency of 15 kc. with a speed of about three signals a second. During each period of 10 seconds, from 1 to 10 signals are emitted to indicate the depth measured by the pressure meter attached to the trawl net.

For example, 2 signals per 10 seconds may indicate that the net is moving at a depth of about 15 to 20 feet; 3 signals at 20 to 25 feet; 4 signals at 25 to 30 feet, etc. When a depth of 60 feet has been reached, the series of signals start again with one per 10 seconds. No difficulty is experienced in

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 ABSTRACTER: Kathryn L. Osterhaug

2.118 GERMAN OWNERS GIVE THEIR VIEWS ON PROPULSION METHODS FOR TRAWLERS

Anonymous
World Fishing 5, 28-31, 42 (October 1956)

New stern trawlers.--Six stern trawlers are either under construction or on order at Rickmerswerft, Bremerhaven, Germany. All of them are not similar.

The GHG-stern-trawler will be built not only with the new stern trawling arrangement, but also with the bridge and engine room located forward.. Another new arrangement is the propulsion by Voith-Schneider propellers sited forward. This form of propulsion has proved to be excellent with tugs and is expected to increase the maneuverability of the trawler. It also makes the conventional steering plant superfluous. The principal dimensions are approximately:

Length overall	206 feet	6 inches
Length between perpendiculars	193 "	1 "
Breadth moulded	31 "	3 "
Depth to shelterdeck	22 "	6 "
Draught, mean	13 "	

At the aft end of the vessel are the stern trawling arrangement, the net room and the fuel bunker. Forward of these are the fish-meal plant, the fish-meal storage space, liver processing room and liver storage space. The fish hold, with a capacity of about 6,000 cwt., is located amidships with the fish processing plant immediately above it on the upper deck. The fore part of the fish hold can be used for deep freezing. In the forward section are several bunkers, accommodations for 42 men, and the engine room. Two 750 h.p. diesels operating two Voith-Schneider propellers give the vessel a speed of about 13 knots.

The net is hauled up the stern slipway and emptied through two hatches on to the lower processing

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 ABSTRACTER: Kathryn L. Osterhaug

3.0 MEAT, FISH AND F.I.O.

Anonymous
Report of the Food Investigation Board (Great Britain) for 1955, 23-30 (1956)
Food Manufacture 31,382-383 (September 1956)

Quality of iced fish.--Better methods of sensory and objective assessment of quality of iced white fish are being sought, and investigations are continuing on the efficacy of a panel system of scoring quality on the basis of appearance, smell and taste. The tetrazolium test paper for rapidly assessing quality has been applied in experiments on the spoilage of fish stowed in ice, quality being assessed at the same time by the usual bacteriological, chemical and organoleptic methods.

"Clean" and "dirty" ice.--The bacterial loads on washed and unwashed fish, measured within 1 hour of washing, were rather similar. This work has been continued and has shown that the ice used on board the fishing vessel may have very high bacterial loads by the time it is used for icing the catch. The use of such ice would wipe out any advantage gained by washing the fish. Experiments with "clean" and "dirty" ice proved that though the fish in "clean" ice kept some two to four days longer than that stored in "dirty" ice, washing had only a very slight effect.

Fish box cleaning.--Scrubbing, with the use of a strong disinfectant, is the only practicable method of cleaning wooden boxes. Boxes coated with an impermeable resin were much less heavily contaminated than the porous wooden ones and were more easily cleaned. Unless both types of box were scrubbed, however, surface contamination increased despite the use of disinfectants.

Fish transport.--Experiments are continuing on the deterioration of fish transported in insulated railway vans and on the strength of existing types of fish boxes. Priority is being given to the production of a 6-stone non-returnable container made by moulding resin-impregnated paper-pulp.

Freezing and cold storage.--Experiments are continuing with a new air blast freezing tunnel built at Torry. A new method of assessing the effect of rate of freezing on damage to fish muscle by

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FISHING BOAT PROPELLERS

DEPTH FINDER FOR TRAWL

FACTORY SHIP-TRAWLERS

FISHERIES RESEARCH IN GREAT BRITAIN (1955)

2.116

repeating the series of signals because the depth of the trawl can be easily determined within a tolerance of 60 feet.

2.114

Vertical axis propellers are now being used more and more in tug boats because of their excellent maneuverability. It has been demonstrated that such propellers, having the load coefficients common for fishing boats, can give the same efficiency as normal screw propellers. An interesting improvement is that the separate blades can be exchanged from inside the vessel without docking. The price, however, may still be considered too high to justify their application in the average fishing boats.

An active rudder, a normal rudder with an electrically driven propeller in a ring or nozzle, has recently been adopted for a number of German fishing vessels. This propeller has about 10 percent of the power of the main engine. In full-scale trials it has been demonstrated that when both propellers are working in tandem there is no loss of efficiency, as when the total power is delivered by the main propeller. Such an installation has two advantages. The maneuverability, especially in harbors, is excellent, and even large commercial vessels can be berthed without the use of tugs. The rudder propeller is very useful for fishing vessels, especially when hauling drift nets.

When the true values of the speeds at which fishing boats will operate are known, there should be no great difficulty in selecting propellers with high efficiency. The wake must also be known in order to estimate the correct speed of advance of the propeller. There are today a number of textbooks available that give useful information about the proper calculation of propellers, based on extensive model experiments. Unfortunately, there is still too much rule of thumb used in the propeller selection by some engine builders, and some naval architects do not take the time to check propellers suggested by engine manufacturers.

3.0

estimating the amount of deoxypentose nucleic acid, a cell constituent in the expressible fluid of thawed fillets, has been developed.

Experiments on the deterioration of fish during cold storage have shown that much of this deterioration is due to changes in the proteins, and an accurate means of measuring such changes would be valuable. The "soluble protein nitrogen" as measured by extracting muscle with dilute salt solutions, is a somewhat variable quantity in fresh fish, and the reasons for these variations have been investigated. A linear relationship exists between the amount of soluble protein in minced cod fillets and the size of the fish with the smallest fish yielding the most soluble protein. Samples from different parts of the same fillet were found to yield different amounts of soluble protein and extraction of proteins in dilute salt solution was found to be almost complete if the myotomes (muscle segments) were dissected out free from the myocommata (partition membranes between the myotomes). A method has been evolved in which only certain myotomes are dissected out and results have so far been obtained for soluble protein with less than 1 percent variation from fish to fish for sizes ranging from 10 to about 32 inches. A small drop in solubility was still found with the largest cod and work on a suitable correction is being undertaken so that soluble protein determinations may be completely independent of the site of the fish.

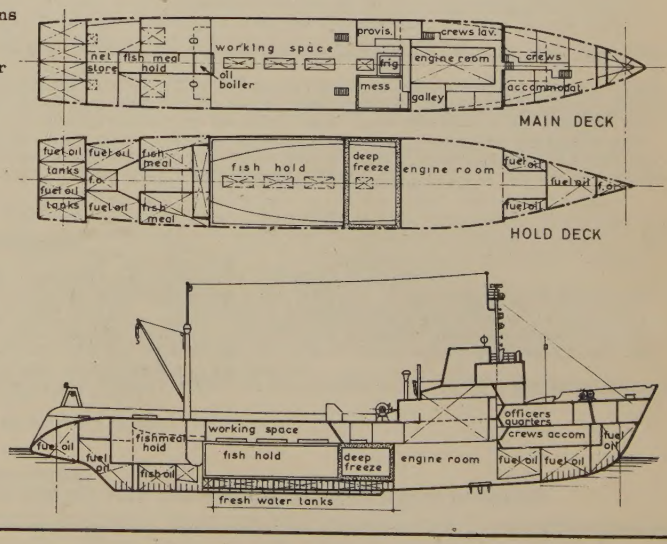
Vertical plate freezing of fish.--Work on freezing of fish at sea has continued during the year. The results of experiments on freezing herring in vertical plate freezers are encouraging. Fish held in cold storage for three months had an excellent flavour when cooked and were free from rancidity. Most of the fish were made into kippers. The yield of first class quality was not as high as that usually obtained with hand-packed half-stone blocks of air-blast frozen herrings, but this was probably due to incorrect setting of the splitting machine.

2.118

deck, where, notwithstanding weather conditions the crew can handle the fish.

See diagrams (Shelter Deck omitted).

NEW GERMAN STERN TRAWLER DESIGNS



2.118 BRINE COOLING OF FISH ABOARD A FISHING VESSEL

Slavin, Joseph W. (Fishery Technological Laboratory, U. S. Fish and Wildlife Service, East Boston, Massachusetts)
Industrial Refrigeration 131, 30, 32, 34 (October 1956)

The design of equipment for a brine-refrigeration system to be used on a specific fishing vessel is based on (1) the amount of fish to be handled, (2) the cooling or freezing time required, (3) the brine temperature desired, (4) the size of the vessel, and (5) certain factors peculiar to the particular fishery in which the vessel is to be engaged.

This paper is chiefly a discussion of the more important factors to be considered in regard to (1) brine tanks, (2) evaporators, and (3) refrigeration machines.

Brine tanks.--The brine tank must be designed so that an adequate, constantly renewed film of cold brine is maintained in intimate contact with the entire surface of the fish. To accomplish this, it is necessary that the ratio of brine to fish be large enough to prevent "packing" of the fish and that a system be used that employs (1) movement of fish through the brine or (2) circulation of brine around the fish.

Evaporators.--The refrigeration effect necessary to cool the brine to the required temperature can be provided (1) by using refrigerated surfaces in the brine tank or (2) by circulating the brine through a brine cooler located in the refrigeration room.

In most brine-cooling and freezing installations aboard fishing vessels, bare pipe coils are used to provide the necessary cooling surface. The bare pipe coils are sometimes located directly against the sides of the brine tank. A 2-to 3-inch space between the coils and the sides of the tank would permit better circulation and increase the heat transfer between the coils and the brine.

Bare pipe coils, finned pipe coils, or refrigerated plates that are located in a separate part of the brine tank and arranged to permit the circulation of brine over the coils at a high velocity offer an

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ABSTRACTER: Kathryn L. Osterhaug

2.12 NEW DIVING SLED

Sand, Reidar F. (U. S. Fish and Wildlife Service, Coral Gables, Florida)
Commercial Fisheries Review 18, 6-7 (October 1956)

A diving sled, fashioned by modifying an Air Force-type tubular steel ambulance litter, is being used by staff members of the U. S. Fish and Wildlife Service gear research and development station at Coral Gables, Florida to obtain close-up views of fishing gear in operation. The controllable two-man submersible sea sled allows a Service diving team to make on-the-spot observations of trawls, nets and other gears while under tow by the research vessel.

The frame of the ambulance litter forms the bottom of the sled and extensions of tubular steel to the shoulder height of the seated sled occupant form a guard rail that provides more comfort and protection than is experienced in free diving operations. Two 18 by 24 inch marine plywood control surfaces are located at a low position near the forward end of the sled to provide control. These control surfaces are actuated by a single-stick aircraft-type control column using three 45° bevel gears that provide both vertical and lateral control. Steel fins added at the rear of the sled give additional stability.

A 3/8-inch lucite "windshield" is installed forward to lessen the impact of the water slipstream on the occupants. A slightly positive buoyancy results from the six Air Force-type 400 P.S.I. oxygen bottles that are strapped to the upper sled rail. The original steel-mesh webbing on the bottom of the litter provides a nonskid cockpit for the craft.

While under tow at either of two towing points forward, the sled has demonstrated a high degree of maneuverability and is capable of descending and ascending easily, and of performing complete

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ABSTRACTER: Kathryn L. Osterhaug

2.12 DEVELOPMENT OF THE PACIFIC COAST OCEAN SHRIMP FISHERY

Squire, James L., Jr. (Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, Washington, D. C.)
Commercial Fisheries Review 18, 1-6 (September 1956)

In the past, the San Francisco Bay area and Puget Sound have been the major shrimp producing areas on the West Coast of the United States. The ocean shrimp off the Pacific Coast were fished commercially for the first time in 1952. From a modest beginning in 1952, a commercial fishery of economic importance to the Pacific Coast is in the process of developing. Exploratory fishing laid the groundwork for the development of this fishery.

Fig. 13 - West Coast ocean shrimp production, 1952-1955.

Exploratory fishing from 1950 to 1953 by the N. B. Scofield resulted in charting six areas having dense concentrations of ocean shrimp off the California coast. Commercial concentrations of shrimp were found at from 40 to 90 fathoms on green mud bottom. The concentrations off the northern portion of California were thought to extend possibly as far as Cape Blanco, Oregon.

Commercial shrimp trawlers operating out of Crescent City, California have developed the area off the extreme south end of Oregon and have reported excellent catches from this area.

Promising indications of shrimp were found in areas off Coos Bay, Cape Lookout, and Tillamook Head, Oregon during 1952 explorations. The first commercial ocean shrimp fishing off Oregon began in 1953.

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ABSTRACTER: Kathryn L. Osterhaug

3.5 SALTING - FISH - HERRINGS, ETC. - MAATJES CURING

Biegler, P.
Die Fischwaren-und Feinkost-Industrie 27, No. 6, 98 (June 1955) (Bremerhaven-F, W. Germany)
World Fisheries Abstracts 7, 37-38 (September-October 1956)

The maatjes herring is made from young herring in which the gonads are not fully developed. The fish are delicate, fatty and lightly salted and should not be exposed to sun; they are caught off the east and west coasts of Scotland and Ireland. They should be carefully sorted and the flavor of the product depends on the salt and fat content. A strongly salted fish is not maatjes cured and too lightly salted fish spoils rapidly. The flesh of the maatjes herring should be light in color. There should be no scales on it. The brine should not have any reddish appearance or have foul odors and should not contain any solid particles of salt. The flesh of fish caught in Aug. are firmer and the milt and roe develop shortly afterwards. German and Dutch maatjes herring do not undergo any storage period but are salted while in a fresh condition, whereas the Scottish herring are heavily salted because the boats return ashore only after several weeks. The Icelandic maatjes is larger, fatty and lightly salted and is made from fish caught in waters off Iceland.

The 3 factors affecting the quality of maatjes herring are the development stage of herring, mild salting and cooler storage. The origin of fish and salt also influence the quality of the product. The processed fish should have a salt content of about 8 to 10%. Dry salting gives a better quality product. During the processing and storage of the final product, maatjes herring is very sensitive to higher temperatures. The product should be stored at 5° C. (41° F.) after salting. At this temperature, the fish "ripens." Maatjes herring fillets are considered a delicacy.

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FREEZING ABOARD SHIP

EXPLORING FOR SHRIMP

NEW DIVING SLED

MAATJES HERRING

2.12 (Cross Reference: 1.85)

Explorations by the John N. Cobb in late 1955 revealed shrimp over a widespread area off the Washington coast. Additional exploratory work in April 1956 again produced good catches. The production areas developed to date are all offshore in the sense that they are outside the international three-mile limit.

The Pacific Coast landings of deep-water ocean shrimp totaled 722,363 pounds in 1955. California accounted for 716,976 pounds. Oregon production in 1955 was 5,387 pounds.

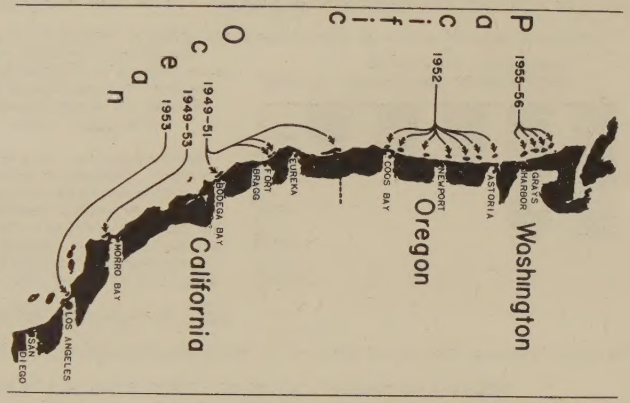

Fig. 2 - Map of exploratory fishing results.

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2.118 (Cross Reference: 3.231)

increased heat transfer rate; consequently the required area of coil surface is reduced. In any installation in which the fish do not come into contact with the coil surface, the use (1) of finned pipe coils with a fin spacing of not less than 1 inch or (2) of refrigerated plates should be considered because of the high rate of heat transfer per lineal foot.

Circulation of the brine in the cooling tank through a brine cooler offers fast and efficient cooling at high evaporative temperatures. A flooded-type brine cooler with a high heat-transfer rate has the following disadvantages that are peculiar to marine operation: (1) danger of the brine freezing and rupturing the tubes because of lack of circulation caused by the accumulation of foreign materials in the tubes or by brine-pump failure; (2) decreased performance due to difficulty in maintaining proper ammonia level because of excessive rolling and pitching of the vessel; and (3) deterioration of tubes due to corrosive action of the brine.

These disadvantages can be reduced in existing installations by the use of (1) an adequate brine-straining system, (2) automatic controls to isolate the cooler in event of failure of the brine pump, (3) a salt-sugar brine with a low freezing point, (4) a proportioning-type level control, (5) equipment having 20-percent larger capacity than required, and (6) heavy-gauge wrought iron tubes, galvanized on the inside. The use of a direct-expansion-type brine cooler should be seriously considered in brine-cooling applications.

Refrigeration machines.--There are two principal types of refrigeration machines: the absorption machine, and the compression machine. The absorption machine operates on steam from the boiler of the ship, offers (1) a low initial cost, (2) economy of operation at low evaporative temperatures, and (3) a minimum of moving parts. Also, its satisfactory operation at variable loads and evaporative temperatures makes possible the utilization of one machine for variable-capacity operation. A problem in existing absorption machines has been the low performance and difficult operation, due to the lack of suitable automatic controls.

Compression machines provide dependable, economical refrigeration at all evaporative temperatures. The wide variety of refrigerants that can be used, together with the low space requirements and versatility of drive, makes the compression machine well suited for marine operation. The limiting factor in the use of the compression machine is that it has narrow load limitations.

2.12

rolls.

Both sled occupants wear SCUBA (self-contained underwater breathing apparatus) allowing full freedom of motion for piloting the craft and for observations. Other protective gear includes carbon-dioxide-inflated life preservers, diving knives, quick-release life belts, shark repellent, and depth meters.

The diving sled has allowed researchers to observe and inspect trawls and other gears from all angles, and to come into actual contact with the gear while under tow at speeds to 3½ knots. Still and motion picture photography have been accomplished safely to depths of 60 feet.

Fig. 1 - Two-man diving sled on the deck of the Service's M/V GEORGE M. BOWERS. is controlled by an operator in front. The second man in rear is free to make observations and photographs.

2.14 SEINE FISHING THRIVES AT WICK

Anonymous
World Fishing 5, 59-62 (September 1956)

In 1938, 76 percent of the aggregate Scottish catch of demersal fish was taken by trawlers, whereas landings by seiners made up just over 10 percent of the total. In 1955, 51 percent of the Scottish catch was taken by trawlers, and 43 percent by seiners. In less than two decades, the seine industry has almost overtaken the trawler industry. The trend towards seine-netting has been particularly prominent in the post-war era.

The following is a description of the seine net operation aboard the m.f.v. Maid of Honour out of Wick, Scotland:

The drag begins with the dhan pole being cast overboard, followed rapidly in sequence by the 6 coils of rope (720 fathoms) neatly stowed on the port side. At an intermediate point in shooting and on a pre-arranged signal, the cod-end and bag of the seine-net are cast overboard. Turning to starboard and paying out the rest of its warp, the vessel completes a rough circle to its first position and picks up its dhan. With the warps attached to the winch, the business of heaving home the gear begins after a preliminary tow on engine-power alone. Led in over the stern by free-running rollers situated on the rail and amidships, the warps are coiled in gradually by use of the winch. When the tell-tale floats break the surface it is only a matter of minutes before the net down to the cod-end is taken aboard. The take of fish in the cod-end is hoisted aloft by a derrick and the cod-line loosened.

Bag and cod-end of net being cast overboard at intermediate point in shooting.

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ABSTRACTER: Kathryn L. Osterhaug

2.2 BLEEDING AND HEAT DEATH IN THE SOUTHERN OYSTER

Fingerman, Milton and Fairbanks, Laurence D. (Newcomb College, Tulane University, New Orleans, La.)
Commercial Fisheries Review 18, 4-5 (October 1956)

Based on previous investigations, the authors postulated that (1) the oyster (Crassostrea virginica) lacks ability to control the volume of its body fluids and (2) one of its responses to physiological stress is a generalized bleeding or loss of body fluids. Experiments were designed to test this hypothesis by determining if the application of heat causes bleeding.

In the first experiment, oysters were heated at different rates. The survival rate and weight changes at each heating rate were noted and compared. The slower the rate of temperature increase the lower was the temperature required to kill 50 percent of the oysters. With a rapid temperature increase (13.2° C. per hour), 50 percent of the oysters were killed at 47.5° C.; whereas with a temperature rise of 0.74° C. per hour, 50 percent were killed at 41° C. The oysters also lost body fluids in response to the heat shock. Oysters heated slowly lost more body fluids than oysters heated rapidly.

In the second experiment, the oysters were subjected to an abrupt rather than a gradual change in temperature by being placed directly into constant temperature baths. No heat death occurred among oysters maintained at 35° C., twenty-nine percent were killed after three hours at 40° C., and fifty percent were killed after 25 minutes at 45° C. The higher the temperature of the water bath, the faster the oysters were killed. The effect of water temperature and duration of immersion on the loss of body fluids is illustrated in figure 4 (see over).

The results of these experiments support the hypothesis that generalized bleeding is one of the

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ABSTRACTER: Kathryn L. Osterhaug

2.15 STORAGE OF LIVE CRABS IN REFRIGERATED SEA WATER

Roach, S. W. (Technological Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations No. 106, 6-7 (September 1956)

The practice of transporting crabs alive from distant fishing grounds to market is a recent development in the fishing industry. Crabs are held on the fishing vessel either in large tanks or more commonly in the flooded hold. Fresh sea water from outboard connections is pumped continuously through the crabs and back overboard at the rate of about 5,000 gallons per minute. Since live crabs like lobsters are very sensitive to changes in the temperature, salinity, and oxygen content of the sea water, abrupt variation in any of these factors must be avoided. Boats carrying cargoes of live crabs, therefore, must use caution in pumping sea water while in brackish water, inlets, river mouths, and harbors if they are to deliver their catch alive.

Refrigerated sea-water holding facilities of the type installed on the fish packer vessel J.R.D. are ideally suited for transporting crabs because the equipment consists of large holding tanks and adequate pumping facilities. At temperatures near 32° F. crabs become virtually dormant; their movements cease and their oxygen requirements become very low. Since the J.R.D. is able to refrigerate sea water, the authors decided to determine the practicality of prolonged holding of crabs at a low temperature with oxygen being provided by aeration.

Preliminary tests were carried out at the Vancouver Station with a small refrigerated sea-water tank which was equipped for continuous circulation and aeration. Live crabs were placed in the tank at room temperature and the water was then slowly cooled to the desired temperature. The crabs became very active at about 45° F. and then progressively less active as the temperature was lowered

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ABSTRACTER: Martin Heerdt

4.29 NEW PRODUCTS FROM FISH OILS PART 2. POLYAMINO FATTY ACIDS DERIVED FROM FISH OILS

McDonald, R. N. and Gruger, Edward H., Jr. (Fishery Technological Laboratory, Branch of Commercial Fisheries, Seattle, Washington)
Commercial Fisheries Review 18, 7-11 (September 1956)

The work reported in this paper is directed toward finding new uses for fish oils and consists in studying the chemical derivatives of their constituent fatty acids. Among these derivatives are the polyamino fatty acids, which should have excellent surface-active properties, owing to their highly polar and polyfunctional character. They therefore may find use as fungicides, corrosion inhibitors, detergents, and ore-flotation agents.

In the preparation of the polyamino fatty acids, amination of the double bonds in unsaturated fatty acids and esters was attempted by three methods.

The first method involved the conversion of polyhalo acids to polyamino acids by the reaction with liquid ammonia. Initial work was done on the various haloacids prepared from the reaction of purified oleic acid with hydrobromic acid, with hydriodic acid, and with bromine.

The second method involved (1) the reaction of tetranitromethane with the double bonds and (2) the subsequent reduction of the nitro groups. Only the reaction between tetranitromethane and oleic acid and their reaction products were investigated in this phase of the program.

The third method involved the alkylation of potassium phthalimide with the addition products of hydriodic acid and of bromine to methyl oleate in an attempt to provide an intermediate for the

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Authors' summary

SEINE-NET FISHERY

TRANSPORT OF LIVE CRABS

FLUID LOSS IN OYSTERS

POLYAMINO FATTY ACIDS

2.15 (Cross Reference: 1.86)

to approximately 35° F., at which point they became dormant. Crabs held under these conditions and examined daily for signs of life survived for 12 days at 35° F. without a change in the sea water. Crabs surviving at the completion of these tests were cooked in the usual manner, and the meat was examined and judged satisfactory by the authors.

In a commercial test, 1400 live crabs were transported from Tofino on the west coast of Vancouver Island to Vancouver Harbor by the vessel J. R. D. in a tank containing sea water cooled to 38° F. and continuously aerated. Crabs that were in the tank for 5 days before being unloaded showed a 1 percent mortality. These crabs were cooked and picked and the crabmeat was sold on the local fresh fish market.

The tests show promise for this means of transporting crabs at 38° F. for 5 days and probably longer. However, the crabs do not fully revive if placed in warmer water after spending several days at 38° F. in the tank.

4.29 (Cross Reference: 6.4)

synthesis of polyamino fatty esters. The hydrolysis of the phthalimido groups on these compounds to produce amines will be the subject of further study.

2.14

Throughout the working day, after retying the cod-end with its special quick-release knot, the process of shooting is repeated without variation.

2.2 (Cross Reference: 1.81)

responses of oysters exposed to injurious stimuli.

During some preliminary experiments it was observed that not all of the oysters that had been killed by heat shock gaped. The more rapid the rate of temperature rise, the greater was the percentage of oysters that were killed with their shells tightly closed. Commercial users of oyster-shucking machines have a problem in this regard as the shucking machines are designed on the theory that all steamed oysters will gape.

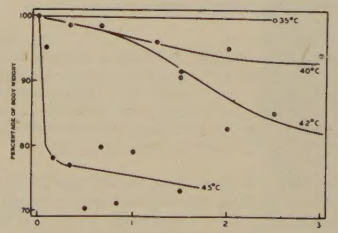

Fig. 3 - Effect of water temperature and duration of immersion on the survival of southern oysters.

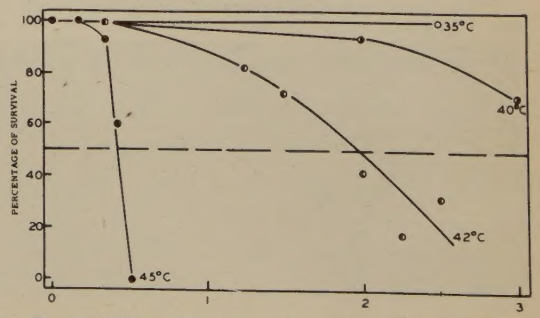

Fig. 4 - Effect of water temperature and duration of immersion on the loss of body fluids in southern oysters.

3.12 EXPERIMENTS WITH ANTIBIOTICS AND ANTIBACTERIAL SUBSTANCES IN THE PRESERVATION OF WHITE FISH AND FILLETS

Shewan, J. M. (Torry Research Station, Aberdeen, Scotland)
Modern Refrigeration 59, 423-425 (November 1956)

Experiments were conducted on the use of certain antibiotics and antibacterial substances for the preservation of white fish such as haddock and cod. The antibiotic used was aureomycin and the antibacterial substances were a quaternary ammonium compound (di-n-decyldimethylammonium bromide, "Deciquam") and a diguanido- compound (1:6 di-4'-chlorophenyldiguanido-hexane). These compounds are known to be active against a wide range of microorganisms and particularly effective against the gram-negative group which are important in food spoilage.

Preliminary to investigating the usefulness of these compounds when incorporated in ice, tests were made of their activities against several pure strains of bacteria that are considered important in fish spoilage. These included pseudomonas spp. and achromobacter spp. Results of the cup-plate method indicated that all of the compounds would be expected to have a considerable effect on the rate of spoilage of fish when incorporated into the ice used on the fish.

The fish, cod and haddock caught off Aberdeen, were gutted, washed as in good normal practice, and packed in clean aluminum boxes with the appropriate ice. Samples were taken on arrival in port (4 to 5 hours after catching) and again at intervals during the storage periods. Ashore, the boxes were kept in a chill room at 2.5° C. and ice losses were made up with the appropriate ices. The fish sampled were examined organoleptically in both the raw and cooked states by a trained taste panel. Bacterial counts were made and total volatile bases (TVB) and trimethylamine (TMA) determined on the raw fish.

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ABSTRACTER: Kathryn L. Osterhaug

3.12 EFFECT OF CHLORTETRACYCLINE TREATMENT OF FISH ON DEVELOPMENT OF CERTAIN FOOD-POISONING BACTERIA

Bluhm, H. M. and Tarr, H. L. A. (Technological Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations No. 106, 8-10 (September 1956)

Studies begun in 1950 have proved that aureomycin or chlortetracycline (CTC) will delay the rate of bacteriological spoilage of fish when applied in extremely low concentrations. CTC also has been incorporated in flake and block ice and in refrigerated sea water and used successfully to retard spoilage of fish under commercial conditions. Applied in other ways, CTC has delayed the post-mortem deterioration of whale carcasses and the bacterial souring of chilled oyster meats. In the United States, CTC is permitted by Food and Drug Administration regulations for the control of bacterial spoilage in eviscerated poultry. Normal cooking removed all chlortetracycline residues from properly treated poultry which contains no more than 7 parts per million (p. p. m.) of CTC in any portion of the flesh.

Studies as yet incomplete, suggest that the small residual quantities of CTC which occur in fish iced with CTC ice or transported in refrigerated sea water with CTC will be removed as the fish is cooked. The possibility exists, however, that transient preservation of fish with CTC might favor the growth of specific food-poisoning bacteria should these gain access to fish.

The most widely recognized types of food poisoning caused by bacteria are (1) botulism, (2) Staphylococcus poisoning and (3) paratyphoid infections. Fish are usually stored well below 50° F., so that the bacteria which cause the first two types of poisoning, do not develop. These types of food poisoning rarely occur in fish. Botulism and Staphylococcus poisoning are characterized by the

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ABSTRACTER: Martin Heerdt

3.12 PENETRATION OF CHLORTETRACYCLINE INTO FISH MUSCLE AND ITS DESTRUCTION BY HEAT

Steiner, G. and Tarr, H. L. A. (Fisheries Research Board of Canada, Pacific Fisheries Experimental Station, Vancouver, B. C.)
Canadian Journal of Technology 34, 215-219 (July 1956)

The concentrations of chlortetracycline (CTC) in flesh of gray cod held in ice containing 1 μgm. per gm. of the antibiotic, or in refrigerated sea water containing 2.8 μgm. per gm. were determined by microbiological assay. The destruction of CTC in fish flesh was determined in samples heated to 60°, 82°, and 99° C.

Gray cod (Gadus macrocephalus) that had been iced for 1 or 2 days on the fishing boats were eviscerated, washed, and iced thoroughly, one group with ordinary crushed ice and the other with ice containing 1 μgm. per gm. of CTC distributed by the carboxymethylcellulose-sodium chloride method. Similar fish were held in refrigerated circulating sea water at -1° ± 0.5° C. with and without 2.8 μgm. per ml. of CTC. At intervals, fish were removed and filleted, samples near the tail and from the visceral cavity wall were taken, and acid extracts from each sample were prepared and assayed for CTC by the pad plate microbiological assay. Limit of sensitivity of the assay was assumed to be 0.3 μgm. of CTC per gram of muscle.

The results showed that gray cod rarely contains indigenous substances causing fictitious CTC assay results. The fish stored in the CTC ice absorbed small amounts of CTC after about 5 days, mainly in the thin visceral cavity walls and in the skin. Fish held in refrigerated sea water with CTC showed definite penetration earlier than fish in CTC ice, but in these also, the higher concentration was present in the visceral cavity wall and the skin.

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ABSTRACTER:. John A. Dassow

5.112 EFFECT OF SOME METAL IONS ON THE STABILITY OF NATURAL VITAMIN A

Back, Karl (Roy. Inst. Technol., Stockholm)
Acta Chem. Scand. 10, 334-5 (1956) (In English)
Chemical Abstracts 50, 13368 (September 25, 1956)

The acceleration of the oxidation of fat by metal ions, even when present in very small concns., and the resultant destruction of vitamin A when the fat contg. it turns rancid through oxidation were investigated to det. the concn. of some metal ions required to cause a measurable acceleration of vitamin A destruction. The metal ions were removed from fish-oil concentrates, contg. 100,000 I. U. vitamin A/g., by percolating a soln. of equal parts oil and iso-PrOH (with C_6H_6 added to insure complete miscibility) through a cation exchanger in the H form. Solns. of Al, Cu, Fe, Ni, Sn, and Zn chlorides in abs. EtOH were added to the samples to give a concn. of 2% EtOH and 1, 10, or 100 p. p. m. of metal ion. The samples were distributed in a no. of vials stored for different lengths of time at 35.4° according to the Schaal oven test (cf. Simons, et al., C. A. 34, 4521[6]). At intervals 2 vials of each sample of oil were removed from the oven and individual detns. of the vitamin A content immediately made by measuring the absorption of a soln. of the oil in hexane, purified by percolation through a column of defatted bone meal according to Dowler and Laughland (C. A. 46, 9790c). The absorption was corrected by using the Morton-Stubbs equation and the vitamin A content calcd. by using a conversion factor of 1900.

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FRESH FISH PRESERVATION

DESTRUCTION OF CHLORTETRACYCLINE

ANTIBIOTICS AND FOOD POISONING

VITAMIN A STABILITY

3.12

The effect of heating times and temperatures was determined by placing stainless steel tubes with 12 grams of a suspension of minced cod flesh, containing 6.5 or 16.0 μgm. of CTC per gram, in a heated water bath. After heating, the samples were frozen promptly and kept frozen until CTC assays were conducted in a similar manner as before. The results indicated that at 60° and 80° C. there is about the same amount of destruction of CTC, and that this is not increased appreciably by heating for 5 minutes after the sample is up to the temperature. At 99° C. there was much more marked destruction of CTC and further destruction occurred on holding the samples an additional 5 minutes at this temperature. Thus, heating, such as could occur in the usual mild cooking procedures for fish, would destroy a very large percentage of the CTC as judged by microbiological assay.

Table II.

Penetration of CTC into Eviscerated Gray Cod Stored in Ordinary Sea Water and in Sea Water Containing 2.8 μgm./gm. of the Antibiotic

Section of fish*	CTC in μgm./gm. after days*						
	0	1	2	4	5	6	7
Ordinary sea water							
V + S	0		0		0		0
V - S	0		0		0		0
T + S	0		0		0		0
T - S	0		0		0		0
Sea water with CTC							
V + S		1.5	3.0	1.5		2.16	3.0
V - S		0	1.23	1.23		1.26	1.14
T + S		1.2	1.5	1.5		1.26	2.55
T - S		0	0	0		0	0

*V+S=Visceral cavity wall with skin
V-S=Visceral cavity wall without skin
T+S=Tail end of fish with skin
T-S=Tail end of fish without skin
†0=<0.3 μgm./gm.

5.112

3.12

Organoleptic judgments of the raw odor and cooked flavor indicated that no difference could be detected between fish stored in ordinary ice and in ice, containing the quaternary ammonium compound (165 p.p.m.) or the diguanido compound (25 p.p.m.). In general, the chemical tests supported these conclusions, although the bacterial counts were somewhat higher in the fish stored in ordinary ice.

In the first experiments using aureomycin at the 2 to 3 p.p.m. levels, encouraging results were noted and it was decided to increase the concentration to 5 p.p.m. At this concentration a very definite improvement in the keeping quality of the fish resulted.

Organoleptically the fish kept in aureomycin ice for 23 days possessed the quality characteristics of fish kept in ordinary ice for 13 to 14 days. Thus, the limit of edibility has been extended by about 10 days. There appeared to be a marked suppression of bacterial growth, and although the TMA values were only slightly lower than those of fish in ordinary ice, the TVB values were markedly lower.

3.12 (Cross Reference: 2.05)

growth of the bacteria in the food itself and the production of toxic substances in the food. Outbreaks of botulism owing to fish have been comparatively rare and have been confined in America to cured products and those which are eaten without being cooked just before serving. Cooking or heating the product at 212° F. for 10 minutes is known to destroy preformed botulinus toxin in foods and to make them safe as human food. Paratyphoid or typhoid poisoning, which develops through introduction of the disease-producing bacteria into the host, usually occur from the consumption of uncooked shellfish that have been harvested from contaminated waters. They may occur from eating cooked shellfish such as crab, lobster, and shrimp if the meat has been contaminated during its removal from the shell.

Objective.--The authors studied the effect of CTC in fish on the growth of bacteria that may cause botulism or Staphylococcus poisoning.

Experimental.--Fillets obtained aseptically from strictly fresh lingcod fillets were minced and divided into four portions. Freshly prepared cells of food-poisoning strain of Staphylococcus aureus were added to only two of the four portions. Two p.p.m. of CTC were then added to one of each of the inoculated and uninoculated portions. Samples of each of the four portions of fish were stored for 5 days at 50° F. in small sterilized glass jars. By direct count the number of natural spoilage bacteria found in the untreated fish tissue after 5 days was about 60 times the number found in the CTC treated tissue. The number of Staphylococci found in the inoculated but untreated fish tissue after 5 days was about 10 times the original number, which in the inoculated and CTC treated fish after 5 days was about 2 times the original number. Typical Staphylococcus organisms were found to predominate in the inoculated samples.

Approximately 1000 heat-resistant spores of Clostridium botulinum (type E) were introduced, in a second experiment, into untreated and CTC-treated lingcod tissue as in the above Staphylococcus experiment. These samples were stored for 3 days at 50° F. The approximate numbers of living botulinus organisms at the beginning and end of the experiment were determined by culturing the diluted material in a special medium for one week to induce the organisms to form heat-resistant spores. Fish treated with 2 p.p.m. of CTC showed a decrease of about 40 percent in the C. botulinus population, whereas the untreated tissue showed no change.

3.19 SOME CHEMICAL AND ORGANOLEPTIC CHANGES IN GAMMA IRRADIATED MEATS

Groninger, H. S.; Tappel, A. L.; and Knapp, F. W. (Department of Food Technology, University of California, Davis, California)
Food Research 21, 555-563 (September-October 1956)

Purposes.--This study was made to define the major chemical and organoleptic changes in irradiated beef, pork, chicken, and fish.

Experimental.--The meats and fish were finely ground, thoroughly mixed, packed in No. 2 enameled cans, evacuated, gassed with nitrogen or oxygen through a small hole, soldered shut, and frozen in a -18° C. room. Samples were thawed, irradiated, refrozen, and held in the frozen state until analysed. Assays were made for drip, moisture, peroxide values, carbonyl compounds, hematin pigment concentration, tocopherols, riboflavin, niacin, and thiamine. A multiple-comparison method was used to evaluate meat samples organoleptically. Judges scored each coded sample for the "difference" between it and the labeled control. Numerical values assigned to the "difference" descriptive terms were None—0; Slight—1, 2; Moderate—3, 4, 5; Large—6, 7; and Extreme—8, 9.

Results.--Changes in the irradiated fish are tabulated (see over). Salmon irradiated at a dose of 2 million roentgens equivalent potential (megarep) in a nitrogen atmosphere was bleached and had a metallic and burned odor. Flavor and color of irradiated salmon were significantly different from flavor and color of control salmon. The loss of carotenoid pigments, mainly astaxanthin, was a function of the radiation dose. Irradiated halibut did not show any color, texture or major odor changes; flavor of irradiated halibut, however, was significantly different from the flavor of the controls. Tuna irradiated at 2 megarep had a desirable pink color, undesirable burned odor, a color and

(over)

 ABSTRACTER: Martin Heerdt

3.236 FRYING OILS--RECENT TRENDS AND DEVELOPMENTS

Bubuynn, V. K.
Paper presented at New England Fisheries Technologists' Meeting (Boston, Massachusetts) (December 11, 1956)

Experimental.--Refined cottonseed oil, refined corn oil, shortening, specially processed HF cottonseed oil, specially processed HF corn oil, and a modified coconut oil were compared as a frying medium for raw breaded fish sticks. Each of the oils were used individually in a frying operation that lasted for 7 days, during which time fresh oil was added to maintain the oil level in the frying bath.

Results.--Data plotted (see over) show how the six different oils performed in use. Graph 1 shows the characteristics of each oil with regard to free fatty acid buildup, whereas graph 2 shows the characteristics of each oil with regard to color development.

Discussion.--The data show that cottonseed oil and HF cottonseed oil and shortening are inferior to corn oil and HF corn oil. Reasons for this inferiority are not apparent. The difference in the oils, however, is definitely peculiar to frying operations with fish for these oils behave equally well in frying operations with potato chips, shoestring potatoes, or chicken.

Fish that had been fried in modified coconut oil had a bland to sweet flavor that was entirely different from the customary taste and odor of fried fish. For palates that enjoy an unusual flavor in sea food, modified coconut oil is an ideal oil in that its performance and stability both in the frying bath and in the storage life of the fried food was very good.

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 ABSTRACTER: Martin Heerdt

3.19 CHARACTERISTICS OF ELECTRON-IRRADIATED MEATS STORED AT REFRIGERATOR TEMPERATURES

Kirn, J. F.; Urbain, W. M.; and Czarnecki, H. J. (Research Laboratories, Swift and Company, Chicago, Illinois)
Food Technology 10, 601-603 (December 1956)

Very little information has been published about the physical changes in and the keeping qualities of irradiated meats that have been stored for extended periods of time.

Purpose.--This paper reports on experiments designed to evaluate the keeping qualities of irradiated meats from different species of animals including both skeletal and organ meats processed in various ways.

Procedure.--Cuts of meat from different animals were selected for quality and variety and were obtained in both fresh and cured condition. The meats were hermetically sealed in tinned containers (cans) prior to irradiation and irradiated with a 2,000,000 volt capacitron electron generator. Irradiation was controlled to give an internal dose of either 1.45 million roentgen equivalents potential (rep) or 2 million rep at the center of the can. Unfrozen samples were held at 1° C. with water ice during the irradiation, whereas frozen samples were held at -29° C. with dry ice during irradiation. All samples were stored at 7° C. after irradiation.

Organoleptic evaluation.--Samples were prepared for taste panel evaluation on the first or second day after irradiation. The precooked irradiated samples were heated in an oven until thoroughly warm, whereas the raw irradiated samples of pork sausage, hamburger, bacon, and steak were broiled. All samples were evaluated organoleptically by a panel of six people. Each sample was graded on the

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 ABSTRACTER: Martin Heerdt

4.61 U.S.F. & D.A. APPROVES USE OF SODIUM BISULPHITE TO CONTROL DEVELOPMENTS OF BLACK SPOT IN SHRIMP

Anonymous
Fishing Gazette 73, 87 (September 1956)

The use of sodium bisulphite to control black spot in shrimp has been approved (Aug. 13) by the U. S. Food & Drug Administration. Approval was granted as the result of scientific experiments which revealed that black spot is not caused by bacteria, but rather by oxidation. (Dr. Fieger, Louisiana State University, in experiments initiated by a Grants-in-aid program, and later by Shrimp Association of the Americas funds.)

Work on the problem of finding a substance to prevent oxidation was initiated also under the direction of Dr. C. P. Idyll, of the Marine Lab. of Miami University, and extended tests disclosed the practicability of the use of sodium bisulphite under working conditions aboard commercial trawlers.

Sodium bisulphite has been used for some time with Government approval as an antioxidant to prevent the darkening of dried fruits.

Shrimp overexposed to this cheap chemical may take on a slightly yellowish discoloration and a slight off-taste, and the best procedure is to use this chemical as a dip. The solution used at sea can be compounded from seawater and the sodium bisulphite, and shrimp can be dipped before icing down the shrimp in the hold.

Detailed instructions for use of the dip, etc., are expected in the near future.

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CHANGES IN IRRADIATED FISH

CHARACTERISTICS OF IRRADIATED MEATS

FRYING OILS FOR SEAFOODS

CONTROL OF BLACK SPOT IN SHRIMP

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basis of pigment color, texture, and flavor according to a scale of 9 and 10 for excellent, 7 and 8 for desirable, 5 and 6 for acceptable, 3 and 4 for poor, and 1 and 2 for very poor or repulsive. Subsequent evaluations by the panel were made at approximately 14 days, 30 days, and 1800 days.

Results with color.--Initially, the red pigments of all of the canned raw meats showed irradiation damage, but they recovered on storage until all except beef liver exhibited desirable pigmentation. All raw beef and beef products received lower numerical grades than were received by comparable pork and pork products. Beef, both broiled and roasted, showed, with the passage of time, an abnormal change in pigmentation from the usual brown cooked color to a bright pink color. Surface pigments were very unstable in air, and faded after a few minutes. Cooked pork and veal, as well as lamb, also showed pigmentation tendencies similar to those of beef. With the passage of time, they also took on a pink color, but this color was not of the same degree of intensity as the color of beef.

Results with texture.--Both the precooked and the raw irradiated samples, were in general of very good texture. Beef liver was an exception in that it exhibited extensive shrinkage and the loss of much meat juice. Protein changes in the raw beef samples showed up after long storage as small needle-like crystalline clusters, particularly in the connective tissues. X-ray diffraction and ultraviolet absorption studies proved these crystals to be pure L-tyrosine. L-tyrosine was found extensively throughout raw irradiated beef samples, however it was almost entirely absent from raw pork and was completely absent from all precooked products.

Results with flavor.--Irradiated meats have a tendency to recover flavorwise as well as colorwise on holding under anaerobic conditions. Flavor improvement was found to take place over a period of 10 to 30 days, after which further aging did not improve the flavor. Pork, lamb, and chicken showed the least changes in flavor and decreasingly so in the order listed. Beef products, raw, cooked, cured, or salted all exhibited an extremely bitter flavor in addition to those flavors usually attributable to irradiation. Chicken, lamb, fresh pork, and bacon were not bitter, and did not have a bitter after-taste. They did, however, have a slight irradiated flavor, but these were considered as not too "objectionable" by the taste panel. The flavor of cooked lamb was described as being "strong."

4.61 (Cross Reference: 1.85)

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flavor significantly different from the color and flavor of the controls, and 30 percent oxymyoglobin. Oxymyoglobin at a dose of one megarep was 100 percent. This level agreed with visual observations of an intense pink color.

Changes in irradiated salmon (S), halibut (H), and tuna (T) packed in nitrogen

Irradiation level	Organoleptic average score differences						Thiamine retention[2]			Carotenoid retention			Succinoxidase retention	Oxymyoglobin
	Color			Flavor										
S, H, & T	S	H	T	S	H	T	S	H	T	S	H	T	T	T
r.e.p.x10^{-6}	Av.	Av.	Av.	Av.	Av.	Av.	%	%	%	%	%	%	%	%
0	--	--	--	--	--	--	100	100	100	100			100	~0
0.2	--	--	--	--	--	--	--	--	79	32			--	30
0.5	6.6[1]	2.2	2.2[1]	2.7[1]	1.6[1]	2.2[1]	--	--	64	12			--	30
1	7.2[1]	0.5	0.5	3.8[1]	2.9[1]	3.1[1]	46	14	35	19			30	100
2	7.6[1]	1.1	2.1[1]	4.3[1]	3.8[1]	3.9[1]	16	6	11	2			30	30
4	7.6[1]	1.9	1.7	6.1[1]	5.3[1]	5.2[1]	3	0	4	3			70[3]	30

[1]Significant at 1% level. [2]Fluorimetric determination. [3]May be in error.

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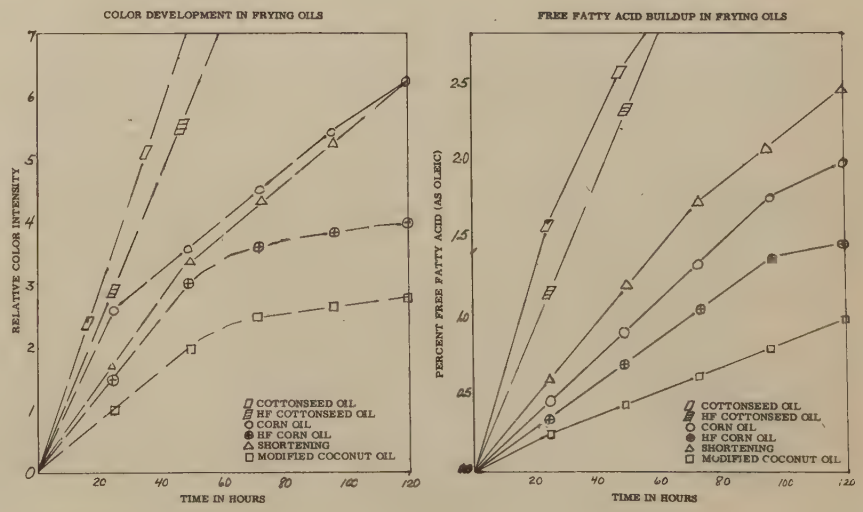

3.236 FINE-LINE FOOD-DENSITY CONTROL

Kelsey, Robert J.
Food Engineering 28, 66-67, 198-199 (July 1956)

Many new ideas for automatic product control are incorporated in a million-dollar seafood plant just opened in Gloucester, Massachusetts, for production of heat-and-eat items. Frozen perchies, bite-size fish cakes, and French-fried scallops are produced at 1,500 pounds per hour on one line. Product density is regulated by a batter-density controller that (1) blends dry and liquid ingredients (2) controls batter consistency, and (3) records viscosity data. The controller works as follows:

Dry batter mix is chuted into the machine from top-floor storage bins. Inside the unit, a vibrating feeder proportions powder to the blender. The amount is controlled by amplitude of vibrations and a variable gate at the end of the vibrator.

Water-rate is adjusted by a hand valve. But there is an electric valve for automatic shut-off. Mix is brought as near to the desired end point as possible with the two hand adjustments. This cuts work-load on the Viscometran.

Batter circulates continuously between fish product, blender, viscosimeter, and a sump tank.

As fluid enters the viscosimeter, it flows around a spinning bob. Viscosity of the batter creates resistance to this spin, which is translated into an electrical signal and measured by the controller-recorder. If the batter is too thin, controller starts vibrator and adds dry mix. If too thick, solenoid valve on water line opens.

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ABSTRACTER: John A. Dassow

3.26 TEMPERATURE MEASUREMENTS ON FROZEN FISH DURING ROAD TRANSPORT

Nichol, D. L. and Lawrence, J. (Humber Laboratory, Grimsby, England)
Modern Refrigeration 59, 316-319 (September 1956)

An objective in the highway transportation of frozen fish is to keep any temperature rise in the product to a minimum with a minimum amount of insulation in order to obtain a maximum payload. This paper is concerned with temperature measurements in a large road container operating under normal commercial conditions. No prior information was available concerning the temperature changes suffered by fish in various parts of the load.

A container of light alloy with a cargo capacity of 600 cubic feet was used in the tests. It was insulated with 3 inches of expanded ebonite. The internal dimensions were 16½ feet x 5 ¾ feet x 6 1/3 feet high. The average load of frozen fish is about 7 tons. To facilitate quick loading and unloading two large doors occupy the whole of one end of the container.

Temperature measurements were made with copper-constantan thermocouples using a multi-point recording potentiometer that was carried in the cab of the truck.

Thermocouples were frozen into the center of representative fish blocks. The test blocks were kept in the same cold room as the fish awaiting transport and were inserted into appropriate cartons immediately before loading. After unloading at the end of the journey, they were removed from the cartons, carried back and returned to cold storage for use in the next run.

The test blocks were placed in one of the two middle positions in cartons at the eight corners of the load, as it was felt that if fish in these positions suffered no serious rise in temperature, the conditions for the load as a whole could be considered satisfactory. Other thermocouples were placed in the air space above the load and on the outside of the top of the container. A single test block of fish was also placed in a carton at the center of the load.

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ABSTRACTER: Kathryn L. Osterhaug

3.239 CHEMICAL CHANGES IN FISH ACTOMYOSIN DURING FREEZING AND STORAGE

Seagran, Harry L. (Fishery Products Laboratory, Ketchikan, Alaska)
Food Research 21, 505-509 (September-October 1956)

Object. -- Changes in the properties of the actomyosin fraction of fish muscle that had been in frozen storage were investigated.

Materials and methods. --All of the experiments were carried out on actomyosin isolated from the muscle tissue of yellow-striped rockfish (Sebastodes nebulosus) according to the methods of Dyer, French, and Snow (1950) and Greenstein and Edsall (1940) with slight modification.

Preparations of actomyosin were isolated from 15.0 gram samples of finely ground flesh by extraction for 2 hours at 0 to 2° C. with 280 milliliters of pH 7.30 buffer solution containing 0.50 normal KCL and 0.03 normal $NaHCO_3$. The total and "reactive" sulfhydryl (-SH) content of the isolated actomyosin was estimated by the method of Tsao and Bailey (1953) to characterize any change in chemical reactivity. Ostwald viscometers calibrated with the aforementioned buffer solution were used to measure the viscosity of dilute actomyosin preparations at 0.00° ± 0.02° C. The buffer solution was used to prepare the actomyosin dilutions. Solubility of the actomyosin was estimated by comparing the total actomyosin recovered during the usual extraction and precipitation process with the total protein content of the original 15.0 gram sample.

Results. --If actomyosin was frozen and thawed, the fraction still soluble in dilute salt solution increased in reactive -SH groups only slightly or from 52.4 to 55.6 percent of the total -SH groups. The fraction, which aggregated or lost its salt solution solubility, increased in reactive -SH groups to a larger but more variable degree or from 52.4 to 66 percent of the total -SH groups. Total -SH groups remained constant on freezing at 0.76 grams of cysteine per 100 grams of protein.

An immediate decrease from 1.70 to 1.17 in intrinsic viscosity was noted on freezing actomyosin.

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ABSTRACTER: Martin Heerdt

6.137 SEPARATION OF SOAPS FROM UNSATURATED OILS INTO GROUPS OF LOWER AND HIGHER IODINE NUMBER

Higashi, Hideo, et al.
Japan 226, ('55), Jan. 21
Chemical Abstracts 50, 11692 (August 25, 1956)

Sardine oil (70 g.) with an iodine no. of 147 in 280 g. MeOH was sapond. by heating for 40 min. with 21 g. NaOH in 21 g. water, heated 30 min. with 3.5 g. $(NH_4)_2CO_3$, let stand overnight, the product filtered, washed with 40 g. MeOH, and the soap (I) and the filtrate (II), resp., decompd. with HCl. I gave 44 g. fatty acid with an iodine no. of 91, and II gave 19 g. fatty acid with iodine no. of 278.5. Bluefin liver oil Thynnus orientalis (417 g.) contg. 83,600 units/g. vitamin A in 1330 ml. MeOH and 70 ml. C_6H_6 was sapond. by heating for 10 min. with 91 g. NaOH and 62 ml. water. The soap was filtered and washed with MeOH to obtain 154 g. of a mixt. (III) of soaps from solid lower unsatd. fatty acids. The filtrate and washings from III were treated with ½ their vol. of water and extd. with C_6H_6 to give 7.75% unsaponifiable substance congt. 1,024,000 units/g. vitamin A (recovery 95.7%).

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BREADED FRIED FISH PRODUCTS

ACTOMYOSIN CHANGES DURING STORAGE

FROZEN FISH TRANSPORT

REFINING FISH OIL

3.239

Prolonged frozen storage at -30° C. for 300 days did not cause any further significant change in the intrinsic viscosity. Actomyosin solubility increased to a maximum after about one month of storage and then declined continuously.

Table 1
Intrinsic viscosity and solubility of actomyosin isolated from frozen-thawed yellow-striped rockfish as a function of storage time

Days storage of fillets at -30° C.	Intrinsic viscosity[1]	Soluble actomyosin[2]
0	1.70	48
¼	1.60	47
1½	1.17	52
8	1.10	49
14	1.22	57
21	1.12	54
28	1.08	60
42	1.10	55
63	0.95	50
91	1.18	48
206	1.25	29
300	1.20	24

[1]Viscosity increment at zero protein concentration (obtained by extrapolation when the viscosity increment is plotted against protein concentration).

[2] $\frac{\text{Total recovered actomyosin} \times 100}{\text{Total protein in 15.0 g. sample of muscle.}}$.

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However, a time switch is set to permit correction for only 10 out of each 30 sec. During the remaining 20 sec., the machine waits while added ingredients are mixed.

Further, the batter sump is equipped with an electrical level probe. This is set for close cycling to minimize correction. And a cut-out relay halts filling until the batter density is "on the nose." Further, to visually inform the foreman of what is happening, a series of panel-board lights wink on and off as various cycling operations occur.

To spot other ingenious equipment on this modern line, let's follow product on its 12-min. trip from fillet to freezer.

A high speed rotary slicer turns fillets into perchies. The fillets drop at random on an aluminum-plate conveyor and are held down as they pass through the knives and a finish water spray. The batter-breading machine includes rocker arms tipped with flat stainless springs that gently pat breaded fish to insure greater adherence. The 20-foot fryer is a shallow-well type with a stainless steel pan that is deeply corrugated for faster heat transfer. The formation of free fatty acids in the cooking oil is minimized by the small capacity, which allows for an 8-hour turnover period for the oil, and the method of distributing incoming oil through perforated pipes, which produce rapid circulation of oil past the heating surfaces. A vertical, screen-tube filter has been found advantageous because the filter can be back-flushed, recoated with filtering agent, and old coating removed while in operation. The products are cooled in a filter air blast cooler and travel over a vibrating "nubbin" grader that removes under-sized pieces. The packaged products are plate-frozen, placed in cartons, palletized, and taken by lift-truck to storage. An automatic CO_2-system with outlets to danger points in the frying operation is combined with automatic damper controls in exhaust and air-supply ducts and protects the plant from flash fires.

3.26

In the majority of runs, the time between loading and unloading was approximately 24 hours, although the actual journey varied from 8 to 18 hours. The remaining time was spent awaiting unloading.

The average results of these experiments are shown in figure 2.

The time/temperature relationship for the cold storage of white fish has been established as follows:

1 month (4 months) at +15° F.
4 months (15 months) at -5° F.
8 months (4 years) at -20° F.

The unbracketed figures above show the approximate time after which the product is still practically as good as the fresh raw material, and the bracketed figures indicate approximately the time at which the fish become definitely distasteful to a panel accustomed to very fresh fish as a standard.

At this rate, a block of fish heated from 0° to +15° F. over a 24-hour period has suffered deterioration equivalent to about 3 days at 0° F., providing it is returned immediately to that temperature.

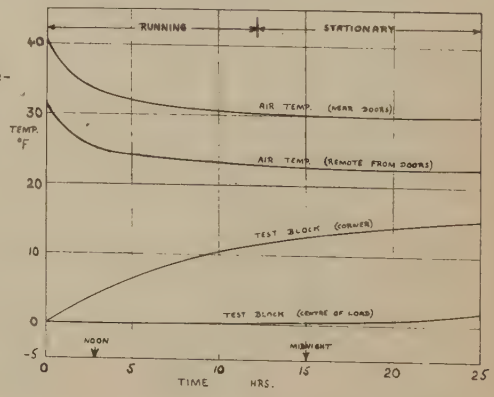

Figure 2. - Air and fish temperature in containers.

3.26 FROZEN QUALITY -- HOW PROTECT IT?

Kelsey, Robert J.
Food Engineering 28, 50 (September 1956)

The temperatures encountered in marketing frozen foods were outlined by John T. R. Nickerson, Associate Professor of Food Products, Massachusetts Institute of Technology, at a recent meeting of members of the Super Market Institute Productivity Committee. A U. S. Department of Agriculture test frozen-food run made in an ice and salt refrigerator car traveling from Oregon to New Jersey showed that with an air temperature of 0° F. at loading, the temperature of the car rose at times to a high of 28° F. Outside temperatures ranged from 62° to 95° F. On arrival, after a running time of 104 hours and a standing time of 113 hours, the product was at 22° F. The best performance that can be expected from ice and salt cars therefore, is in the range above 15° F. Mechanically refrigerated cars in contrast will maintain 0° F. or lower temperatures. However, there are only 930 of these cars in use today and 950 on order. Trucks can provide adequate refrigeration for long distance transportation of frozen foods, however, many are inadequate and temperatures as high as 16° to 18° F. can be found in these loads. Delivery trucks that employ hold-over plants, dry ice, or a combination of the two have been found to have an average air temperature of 36° F. The average product temperature on arrival at the store in these trucks was found to be 10° F.

Most public warehouses maintain temperatures of 0° F. or below, but some 10 to 15 percent maintain temperatures around 15° F. Order-assembly and break-up rooms have been found to range from -6° to 40° F. with products exposed to these conditions for as long as 40 weeks. Frozen food storage rooms in retail stores have been found to average 5.5° F. with a range of from -11° to 37° F. Retail cabinets average 0° at the bottom and 7° F. at a point 2 inches below the load line. About 30 percent of the retail cabinets surveyed were loaded above the safe line. In some instances frozen foods were

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 ABSTRACTER: Martin Heerdt

3.33 THE RESISTANCE OF BACTERIAL SPORES TO SUPERHEATED STEAM

Collier, Charles P. and Townsend, Charles T. (National Canners Association, Western Research Laboratory, and University of California Laboratory for Research in the Canning Industry, Hooper Foundation for Medical Research)
Food Technology 10, 477-481 (October 1956)

For the past few years an aseptic canning system, designed by W. McK. Martin (U. S. Patent 2,549,216) has been used commercially in a number of canneries. In this system the containers and covers are sterilized by superheated steam. Because no data were available on the resistance of bacterial spores to superheated steam, a study was undertaken to determine the rates of destruction and slopes of thermal death time curves ("D" and "z" values) for the sporeforming bacteria Putrefactive Anaerobe (PA) 3679, (a mesophilic anaerobe), and Flat Sour (FS) 1518 (Bacillus stearotheormophilus), a thermophilic facultative anaerobe. These are standard test organisms in the canning industry for use in the establishment of processes for canned foods. In addition, tests were made with a sporeforming facultative anaerobe identified as Bacillus polymyxa (coded as PSO), isolated from a spoilage case involving the aseptic canning system.

The slope of the thermal death time curve (z) and the rate of destruction (D_{350}) values were determined. From these values thermal death time curves were constructed. In calculating the resistance values z and D, Ball's formula method or the general method of Bigelow was utilized. A summary of the resistance characteristics of the three test organisms at different dilutions is given in table 6 (omitted). It was noted that the bacterial spores showed a greater apparent resistance to superheated steam in the more dilute suspensions.

In a comparison between the resistance of the three test spores to superheated steam and to

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 ABSTRACTER: Max Patashnik

3.33 NOTE ON HONEYCOMBING IN DECOMPOSED TUNA

Hillig, Fred (Division of Food, Food and Drug Administration, Department of Health, Education, and Welfare, Washington 25, D. C.)
Journal of the Association of Official Agricultural Chemists, 39, 1015-1016 (November 15, 1956)

Data on the occurrence of honeycombing as an index of decomposition was omitted in the author's paper entitled "Volatile Acids, Succinic Acid, and Histamine as Indices of Decomposition in Tuna" (Journal of the Association of Official Agricultural Chemists 39, 973 (1956))

Honeycombing in canned tuna is characterized by pits in the fish tissue. It usually appears between the layers of tissue, but it may also appear on the cut surfaces. To examine fish for honeycombing, the author pulls the fish apart carefully and inspects for the presence of the characteristic irregular holes or pits that penetrate deeply into the tissue. The number of pits may vary from a few small ones to pitted areas that cover a large portion of the tissue. A transverse section of extensively honeycombed tissue has an appearance suggestive of an empty honeycomb. Honeycombing occurs only if the raw fish reaches an advanced stage of decomposition. In cannery practice, the first evidence of honeycombing may be found as the precooked fish is divided into loins on the cleaning table. Any precooked loins that exhibit honeycombing are usually discarded. Both the producing industry and the various examining laboratories have accepted "honeycombing" as definite evidence of decomposition.

The tabulated data (see over) show that honeycombing was not found in fish in organoleptic classes 1 and 2. When the fish had reached advanced decomposition, as represented by classes 3 and 4, however, honeycombing was generally, although not always, found.

These data, along with the data submitted in the previous paper, confirm earlier observations that honeycombing, when found, is a reliable index of the decomposed condition of the raw material.

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 ABSTRACTER: Martin Heerdt

6.19 THE PRESERVATION OF FISH PRODUCTS FOR FEEDING

Olsson, Nils and Olofsson, N. Edvin
Kgl. Lantbrukshögskol. och Statens Lantbruksförsök, Statens Husdjursförsök Medd. No. 59, 38 pp. (1955) (English summary)
Chemical Abstracts 50, 12331 (September 10, 1956)

A conservate of fish was obtained by adding 1.5 l. of HCO_2H or 20 kg. of molasses per 100 kg. of final mixt. There was no advantage in adding 0.45 l. of HCO_2H or 2 l. of AIV-liquid (a 13.4N mixt. of HCl and H_2SO_4) to the molasses. Slightly better chick growth, on a dry-wt. basis, was obtained from fish meal than from wet-preserved fish when AIV-liquid, HCO_2H, or molasses was used as a preservative. No unfavorable effects were found when chicks were fed wet-preserved fish. Fish meal resulted in a 23-28 g. addnl. daily wt. increase per pig when compared to wet-preserved fish, on a dry-wt. basis. Fish meal and wet-preserved fish resulted in a thinner and looser back fat in pigs when compared with skim milk as indicated by thickness measurements (mm.) of 34.5, 34.8, 36.7 and iodine numbers of 55.74, 57.11, 54.09, resp. A fishy flavor was noted in the fried flesh of two pigs fed fish meal and one fed wet conservate. This flavor was not detected by all members of the panel. The prepn. of dried fish meal is preferred over a wet conservate for animal feeding except where small fish catches and long distances to a drying factory are involved.

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PROTECTION OF FROZEN FOOD

HONEYCOMBED TUNA

ASEPTIC CANNING

FISH PRODUCTS FOR FEED

3.33 (Cross Reference: 1.1)

Relationship between "honeycombing" and organoleptic classes of fish[a]

Species, pack, and reference	Class 1	2	3	4
Skipjack Pack No. 1, Table 2	0	0	+	
Skipjack Pack No. 2, Table 3	0	0	0	+
Skipjack Pack No. 3, Table 4	0	0	0	+
Skipjack Pack No. 4, Table 5	0	0	+	+
Yellowfin Pack No. 1, Table 6	0	0	0	0
Yellowfin Pack No. 2, Table 7	0	0	+	
Yellowfin Pack No. 3, Table 8	0	0	++	
Albacore Pack No. 1, Table 9	0	0	+	+
Albacore Pack No. 2, Table 10	0	0	+	
Albacore Pack No. 3, Table 11	0	0	++	++
Bluefin Pack No. 1, Table 12	0	0	+	+
Bluefin Pack No. 2, Table 13	0	0	+	++

No.	Class	Honeycombed	No.	Class	Honeycombed	No.	Class	Honeycombed
1	2-3	0	8	3	+	15	3	+
2	2-3	0	9	3	+	16	3	0
3	2-3	0	10	3	+	17	3	0
4	2-3	0	11	3	+	18	3	+
5	2-3	0	12	3	+	19	3	+
6	2-3	0	13	3	0	20	4	+
7	2-3	0	14	3	0	21	4	0

[a]0 signifies no honeycombing; + signifies honeycombing; ++ signifies advanced honeycombing.

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3.26 (Cross Reference: 3.24)

stored for from 1 to 6 hours in storage areas held at 39° F.

The effects of these bad distribution practices in terms of product quality were also outlined by Dr. Nickerson on the basis of recent data. Cod fillets held at 10° F. dropped to one-half of the maximum value score in 6 weeks and became unacceptable in 4 months at which time the flesh had changed drastically in texture and flavor. Storage at -10° F., in contrast, produced very little change in the quality of cod fillets and test scores did not fall below 50 percent of their maximum value until 40 weeks had elapsed. Mackerel and salmon were even more susceptible to changes in quality. In meat products, quality followed storage temperature in much the same way. Changes in quality were indicated by the loss of color, excessive drip during defrosting, toughening in ground meats, and loss of succulence in pork and poultry. To retain quality, a temperature of 0° F. was, with few exceptions, low enough to prevent all but minor deteriorations in frozen food quality over a period of a year.

The following points, if observed, will help to retain quality in frozen foods during distribution: (1) make one person responsible for proper storage conditions, (2) make laboratory checks on products that may have thawed, (3) keep storage temperature records, preferably on automatic recorders, (4) use proper dunnage during shipping to insure air circulation, (5) keep a time-temperature record on each large shipment, (6) precool trucks and keep them under refrigeration, (7) keep backroom storage below 20° F. if frozen foods are there for over 1 hour, (8) put older stock at top of retail cabinets, (9) keep frozen foods below load level line in cabinets, (10) provide alarm signal thermometers that will ring if temperatures in display cases rise, and (11) put indicators in packages of frozen foods.

3.33

moist heat, they were found to be far more resistant to superheated steam than to moist heat. Table 7 shows this comparison.

Summary.--Based upon the resistance characteristics of spores of the three bacterial species tested to superheated steam as given in table 7, sterilization of surfaces by superheated steam can be accomplished by heating the surfaces to a temperature above 350° F. for one minute, or to a temperature above 320° F. for 10 minutes.

Table 7
Comparison of resistance--moist steam and superheated steam

Organism	Resistance to moist steam		Resistance to Superheated Steam		
	z	F_{250}	z	F_{250}	F_{350}
B. polymyxa	14.0	0.005	28	3160	0.667
FS 1518	18.2	9.6	26	4680	0.708
PA 3679	13.6	2.0	60	32	0.625

Notes: (1) All spore suspensions water washed three times.
(2) F_{250} and F_{350} values in minutes and based on reduction of 100,000 spores to 1 spore.

3.3343 FACTORS INFLUENCING THE SPORADIC DEVELOPMENT OF DISCOLORATION IN CANNED WET PACK SHRIMP

Landgraf, R. G., Jr. (Metal Division, Research and Development Department, Continental Can Co., Chicago, Illinois)
Food Technology 10, 607-610 (December 1956)

In recent years, sporadic occurrences of discoloration have been noted in canned wet pack shrimp. A brief survey of shrimp canned in the New Orleans area showed the following three forms of discoloration: (a) product discoloration--"graying"--this condition varied from a slight grayish cast to a blackening of the entire surface of the shrimp meat; (b) product discoloration--"bluing"--this condition occurred on the surface of the meat at the head end of the shrimp, usually as a blue spot 1/16 to 1/8 square inch in area; (c) container discoloration--this form of discoloration occurred principally on the surface of the inside of the can adjacent to the headspace. The most prevalent of these forms of discoloration was product graying.

Careful observation indicated that product condition at the time of packing was an important factor in the development of product graying. Experimental packs were made to study the effects of (a) condition of the shrimp when packed, (b) size of shrimp, (c) method of peeling, and (d) reduction of product pH by adding citric acid to the brine.

Experimental.--The shrimp used in these experiments were obtained from a commercial shrimp boat and consisted of one lot of common white shrimp caught by one boat, in an area, during one day of fishing. Iced separately from the remainder of the catch and only 24 hours old when received, these shrimp were in excellent condition.

The following variables were included in the experimental packs: (1) shrimp were iced 1, 5, and 7 days before canning; (2) shrimp of various size groups (pieces, small, medium and medium-mixture) were canned for each time interval; (3) the reaction of hand peeled versus machine peeled shrimp were

(over)

ABSTRACTER: Kathryn L. Osterhaug

4.11 APPLICATION OF CHROMATOGRAPHY TO SEPARATION PROBLEMS IN THE LIPID FIELD

Holman, R. T. (The Hormel Institute, Austin, Minnesota)
Annual Report of the Hormel Institute 1955-56, pp. 32-35 (1956)

Displacement chromatography has been used successfully for lipid separations on model mixtures. It is now being used on natural mixtures of lipids for preparative and analytical purposes.

Products of bacterial oxidation of linoleate.--Two samples containing the unknown alcohol-soluble products of the action of Mycobacterium phlei and Pseudomonas fluorescens upon methyl linoleate were subjected to displacement chromatography using ethyl stearate as the displacer. Two major components were detected in the refractive index-volume curve for each sample. Fractions of the displaced chromatogram were chromatographed on paper. Neighboring fractions having only one component were combined and subjected to infrared, near-infrared, and ultraviolet absorption analysis. The combined fractions were also compared by paper chromatography against linoleic acid and methyl linoleate.

The products of the action of Mycobacterium phlei contained linoleic acid, methyl linoleate, and a minor constituent possessing nonconjugated diene structure that was absorbed much less strongly than linoleic acid. Alkali had no effect upon its ultraviolet spectrum, which indicated the absence of aldehydes and ketones.

The sample from Pseudomonas fluorescens action also contained linoleic acid, methyl linoleate, and a minor constituent with a high hydroxyl content. It was concluded that very small amounts of intermediate oxidation products accumulate during the oxidation of linoleate by these organisms.

Isolation of polyunsaturated fatty acids.--Although it has been apparent for some time that polyunsaturated acids could be separated by displacement chromatography, it has been difficult to demonstrate the separations analytically. In an attempt to demonstrate the separations, a micromethod was devised which could detect less than 1 milligram of the polyunsaturated fatty acid.

(over)

ABSTRACTER: Kathyrn L. Osterhaug

3.4 THEY BUILT A BETTER SMOKEHOUSE

Ghizzoni, Raymond J.
Food Engineering 28, 68-69 (September 1956)

Twelve new air conditioned smokehouses for smoking meats are in use in Boston. Each smokehouse is constructed of steel with a tile floor and a drain as shown in the diagram (see over) to obtain even smoke and temperature conditions.

Design.--Smoke and air drawn from the bottom of the smokehouse by two 6,000 cubic foot per minute (c.f.m.) squirrel-cage fans is heated as it is passed over twin steam coils operated at 80 pounds pressure. Heated smoke and air is discharged at 2000 feet per minute through flat "snouts" that merge horizontally and cover the entire width of the smokehouse. Discharge of air and smoke is changed continuously by a rotary damper located at the snout that diverts the smoke slowly from the top down to the bottom of the smokehouse.

Smoke for all 12 smokehouses is obtained from 2 large smoke generators with 750 c.f.m. turbine fans and introduced into each smokehouse between the fan and the heating coil. Smoke generator temperatures are controlled by a single, one-pen recorder. Manual controls are used on each smokehouse to regulate an exhaust damper as well as two louver-type fresh-air dampers built into the bottom of the heating unit and coupled with the smoke dampers.

Capacity and process.--Each smokehouse holds 22 racks or a total of 1,056 six to eight pound shoulders and 528 fifteen pound hams. Separate showering and cooking cabinets that are heated with live steam are used to prevent cooling of the smokehouses. The meat for hams enters the smokehouse at 50° F. and leaves at 140° F. Hams are smoked 9½ hours, whereas shoulders are smoked 6½ hours. Yields are in direct proportion to smoking time and pumping percentage. Smokehouse shrinkage is at 66.5 percent or 3 percent less than the customary shrinkage.

(over)

ABSTRACTER: Martin Heerdt

7.81 REPORT ON CHEMICAL INDICES OF DECOMPOSITION IN FISH (HISTAMINE)

Williams, David W. (Food and Drug Administration, San Francisco, California)
Journal of the Association of Official Agricultural Chemists 39, 609-611 (August 15, 1956)

A biological method for the determination of histamine in fish was submitted to collaborative study by the Associate Referee in accordance with the recommendation of Subcommittee C.

Each collaborator was sent 5 samples of ground mixed fish in hermetically sealed containers. Sample A consisted of class 1 canned bonito; sample B, class 1 canned tuna; sample C, class 2 canned tuna; sample D, class 3 canned tuna; and sample E, class 4 canned tuna. The Associate Referee prepared samples A and E by grinding the material in a food chopper, mixing it mechanically, and sterilizing the product in glass jars. Samples B, C, and D were a part of a canned experimental pack prepared by Hillig in 1950. Each collaborator was sent a copy of the procedure published in 1956 (Williams, D. W., Journal of the Association of Official Agricultural Chemists 37, 567 (1954)).

Procedure.--The following instructions were given:

Sample A is a practice sample of good bonito with histamine-like substances present in the amount of ca 2 mg/100 g calculated as histamine. Samples B, C, and D are samples of tuna. Samples B and C can probably be used with the fresh ileum without diluting the extract. Add 1 ml to the muscle bath. With sample D, start with a 1:20 dilution of extract and increase or decrease the dilution as required.

Prepare 2 (duplicate) extracts from each of the 5 samples. Retain the reserve sample in a freezer below 32° F. Subs A, B, and C can be conveniently determined at the same time. Subs D and E require dilution and can be used with a less sensitive intestine or with the original ileum after A, B, and C have been assayed. Make assays on two 10 g portions from each of the samples submitted.

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DISCOLORATION OF CANNED SHRIMP

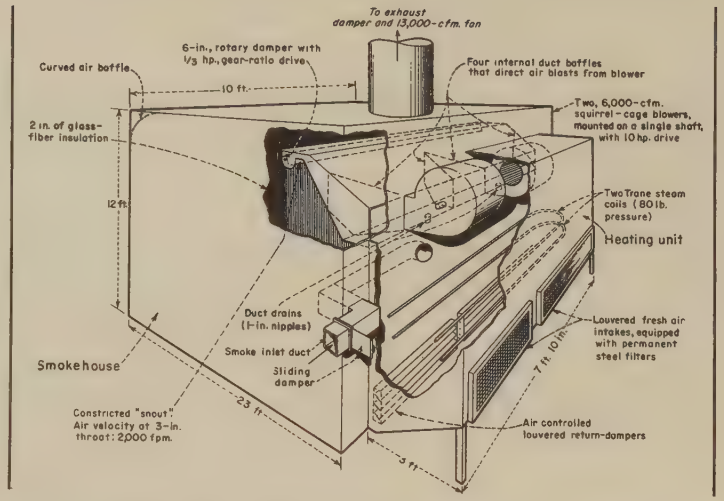
NEW SMOKEHOUSE DESIGN

CHROMATOGRAPHY OF LIPIDS

HISTAMINE, A DECOMPOSITION INDEX

3.4

SMOKEHOUSE CUTAWAY REVEALS UNIQUE AIR DUCT


To exhaust damper and 13,000-cfm. fan
6-in., rotary damper with 1/3 hp., gear-ratio drive
Curved air baffle
10 ft.
Four internal duct baffles that direct air blasts from blower
Two, 6,000-cfm. squirrel-cage blowers, mounted on a single shaft, with 10 hp. drive
2 in. of glass-fiber insulation
12 ft.
Two Trane steam coils (80 lb. pressure)
Heating unit
Duct drains (1-in. nipples)
Louvered fresh air intakes, equipped with permanent steel filters
Smoke inlet duct
Smokehouse
Sliding damper
7 ft. 10 in.
Constricted "snout" Air velocity at 3-in. throat: 2,000 fpm.
23 ft.
Air controlled louvered return-dampers
3 ft.

3.3343

compared at each time interval; and (4) twenty-four cans of medium shrimp were canned with citric acid brine at each packing interval.

Results and discussion.--Based on the data collected upon examination of the samples after 1, 6, and 12 months storage at 98° F., it is concluded that:

1. As the length of storage in ice prior to canning increased, both the product pH and the amount of graying increased. These increases occurred regardless of shrimp size or method of peeling.
2. The severity of product graying increased as the size of the shrimp decreased.
3. With fresh shrimp, no significant difference in product graying could be detected between white shrimp that had been hand or machine peeled. However, slightly more graying occurred in machine peeled than in hand peeled shrimp that had been iced 5 days or longer before canning.
4. Container discoloration occurred in only 10 of the 288 cans examined. None of these cases occurred with shrimp that had been iced for only one day.
5. Citric acid brine added at a pH of 3.0 or 4.6 to the shrimp (finished product pH 6.6 or 6.5) slightly improved the appearance, flavor and texture of the product; the most noticeable effect was an improvement in texture of the finished product. At these levels the citric acid brine had no appreciable effect on product graying.

The amount of product graying was decreased by adding citric acid brine at a pH of 2.2 (finished canned product pH 5.6) to shrimp that had been well iced for 7 days prior to canning, but the flavor and texture of the finished product was impaired.

It is possible that an intermediate amount of citric acid brine which would reduce the finished product pH to 6.0 to 6.4 would result in improvement of canned shrimp.

7.81 (Cross Reference: 2.01)

Results and discussion.--Results are shown in table 1. Considering that only two of the collaborators had previous experience with biological methods, the results are good for samples D and E (class 3 and class 4 fish). Good agreement was obtained for comparative results between duplicate analyses from the same can.

Collaborator 1 had some difficulty in obtaining a guinea pig ileum that would respond properly to stimulation. Once he obtained an ileum that responded properly, he found that the assays went rapidly, and he encountered no further difficulties.

Collaborator 2 had no particular difficulty with the method. He measured the rise as closely as possible without disturbing the smoked drum. He considered 1 mm or less as a check between sample and standard.

Recommendations:--It is recommended: (1) that the biological method for histamine-like substances in fish be adopted as first action, and that further collaborative studies be made, and (2) that study of chemical methods for histamine as an index of decompostion in fish be continued.

Table 1. Collaborative results for histamine-like substances in fish, calculated as mg/100 g histamine

Sample		A	B	C	D	E
Collaborators	1	-- --	1, 1	1, 1	19, 19	290, 290
	2	2, 2	2, 2	2, 2	18, 18	362, 362
	3	-- --	3[a], 4[a]	4[a], 4[a]	15[a], 20[a]	289 --
	4	2, 2	3, 3, 3[a]	3, 3, 2[a]	15, 14, 15[a]	290, 308, 308
	4A[a]		3, 2	2, 2	18, 17	290, 308, 308

[a]Additional separate can assayed.

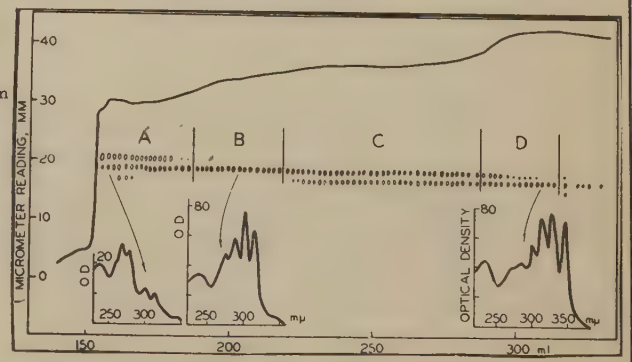
4.11 (Cross Reference: 4.4)

When paper chromatography became available for polyunsaturated acids it offered a much more rapid monitoring method than isomerization. Only minute drops of the sample are required to test the purity of the fractions by paper chromatography, whereas the isomerization method required about one-fourth of the sample for identifying the fractions.

By displacement chromatography using paper chromatography as monitor, the following substances have been obtained free from detectable contaminants:

Octadecatetraenoic acid from codliver oil; ethyl octadecatetraenoate from codliver oil; eicosadienoic acid from rapeseed oil; methyl eicosapentaenoate from hog liver; ethyl arachidonate from hog liver; methyl docosahexaenoate from hog brain.

Figure 1 shows the separation of octadecatetraenoic acid from its concentrate. The complexity of the individual fractions is shown by the paper chromatogram spots, and the spectra of three isomerized samples identifies them as predominantly triene, tetraene, and pentaene, respectively.



Isolation of octadecatetraenoic acid from cod liver oil fatty acids of 18 carbons chain length.

4.12 DETERMINATION OF STRUCTURE AND ANALYSIS OF HIGHLY UNSATURATED AND SATURATED ACIDS OF FISH OILS

Privett, O. S. (The Hormel Institute, Austin, Minnesota)
Annual Report of The Hormel Institute 1955-56, pp. 59-61 (1956)

The alkali-isomerization spectrophotometric method of fatty acid analysis cannot be applied to fish oils because of the lack of knowledge concerning the structure of their common unsaturated fatty acids. Based on the sparse and generally inconclusive information available, it is believed that these unsaturated fatty acids are predominantly characterized by a methylene-interrupted type of unsaturation. Thus, although the mixed fatty acids of fish oils are considerably more complex than most common vegetable and animal fats, it should be possible to analyze them by the alkali-isomerization method with suitable modifications and perhaps in conjunction with a simple fractionation method.

The first step in the development of such a method is the isolation and characterization of the common polyunsaturated acids from fish oils.

Experimental.--Several modifications to increase the accuracy of the method for measuring 4, 5, and 6 double bond acids were made in the alkali-isomerization technique. The major improvements consisted of (1) conducting the reaction in volumetric flasks, (2) dissolving the alkali reagent in methanol and adding it to the reaction flask volumetrically, (3) using an alcoholic solution of the sample, and (4) employing a silicone bath medium for more uniform heat transfer and temperature control.

Fifteen different fish oils were alkali-isomerized and the ultraviolet spectral absorption determined from 230 to 380 mμ. Because of the spectral characteristics of their oils, tuna and menhaden were selected for use in the isolation of polyunsaturated fatty acids. A simple low-temperature fractionation scheme was devised to concentrate the polyunsaturated fatty acids. Concentrates of fatty acids with iodine values over 400 were obtained by urea fractionation of the butyl esters. The present plan is to isolate the individual fatty acids from these concentrates by a combination of distillation and chromatography.

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ABSTRACTER: Kathryn L. Osterhaug

4.92 NUTRITIONAL PROPERTIES OF THE MOLECULARLY DISTILLED FRACTIONS OF AUTOXIDIZED FATS

Kaunitz, Hans; Slanetz, C. A.; Johnson, R. E.; and Guilmain, J. (College of Physicians and Surgeons, Columbia University, New York) and Knight, H. B.; Saunders, D. H.; and Swern, Daniel (Eastern Regional Research Laboratory, Philadelphia, Pennsylvania)
The Journal of Nutrition 60, 237-244 (October 10, 1956)

Experimental.--Commercial lard and refined cottonseed oil were autoxidized at 95° C. for 200 to 300 hours, alembically distilled to remove volatiles, and then fractionated at 280° C. in a molecular still. A hydrogenated cottonseed oil which had been used for deep fat frying for 80 hours at 190° C. also was distilled. These oils were included in the diets of rats.

Except as modified by additions of the distillate fraction, the experimental diets contained 30 percent alcohol-extracted casein, 10 percent fat, 54 percent dextrose, 4 percent salts (U. S. P. no. 2), and 2 percent cellulose, as well as liberal amounts of all known accessory food factors. Nutritional studies were carried out with weanling albino male rats from a homogeneous colony. When the rats weighed 40 to 50 gm., they were placed on a purified diet containing 30 percent lactalbumin and 10 percent fresh lard. At the age of 5 weeks, they were divided into matching groups.

Results.--The rats that received 10 percent oxidized cottonseed oil in their diet lost weight rapidly and died after 2 to 4 weeks. If 10 percent of fresh fat was added to their diet, however, none of the rats died during the experimental period. A group of rats that received a 10 percent level of the distillate from hydrogenated cottonseed oil, which had been used for deep fat frying, grew essentially as well as did those on fresh cottonseed oil. However, when the distillate was combined with oxidized cottonseed oil, growth was significantly below that of the animals receiving both fresh and oxidized cottonseed oils; some of these animals died toward the end of the period of observation.

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ABSTRACTER: Martin Heerdt

4.62 HYDROXYFLAVONES AS INHIBITORS OF THE AEROBIC OXIDATION OF UNSATURATED FATTY ACIDS

Simpson, T. H. (Torry Research Station, Aberdeen, Scotland) and Uri, N. (Ministry of Agriculture, Fisheries and Food, Aberdeen, Scotland)
Chemistry and Industry No. 36, 956-957 (September 15, 1956)

To the present no comprehensive study has been reported of the value of hydroxyflavones as antioxidants for unsaturated fatty acids. A systematic study of the effect of hydroxyl and alkoxyl substituents on the efficiency of flavones as antioxidants for methyl linoleate is now reported.

The antioxidant efficiencies of about 30 flavones were examined in pure undiluted methyl linoleate, in aqueous emulsions and in dilute (0.1M) benzene solutions with cobaltous stearate and ferrous phthalocyanine as calaysts. The oxidations were followed by measurement of oxygen uptake with Warburg apparatus and by iodometric determinations of hydroperoxide.

A series of approximately 30 hydroxyflavones were examined and their antioxidant efficiencies in pure methyl linoleate were compared to that of propyl gallate at the same (usually 2×10^{-4}M) molar concentration.

Table 2 indicates the antioxidant efficiency of the most active flavones in pure methyl linoleate.

These compounds showed similar antioxidant activity in the aerobic, cobaltous stearate and ferrous phthalocyanine-catalyzed oxidations of methyl linoleate in dilute benzene solution. In aqueous emulsions, 7-η-butoxy-3:2':5'-trihydroxyflavone was the most efficient antioxidant.

See table 2, over.

(over)

ABSTRACTER: Kathryn L. Osterhaug

8.51 PROTEINS OCCURRING IN FISH AND SHELLFISH

Ranke, E.; Ranke, B.; and Bramstedt, F.
Arch. Fischereiwiss., 6, 199-218, 343-345, 345-350 (1955) (Summary in English)
Food Science Abstracts 28, 382 (August 1956)

Paper electrophoretic studies on protein breakdown in fish and crustaceans.--Paper electrophoresis was applied to extracts from muscles of fish and crustaceans, as well as to extracts from whole mussels. The species examined were the same as those used previously (see Vol. 27, Abstr. 622). Basic patterns of fractions obtained under certain standard conditions of electrophoresis proved to be typical for each group. During storage, from the 5th day onwards, the patterns underwent various changes, which presumably indicated protein breakdown. Further studies of this kind may perhaps furnish 'freshness' tests for fish, etc., based on the fractions indicative of deterioration.

A peptide occurring in fresh sea fish.--A peptide was detected in muscle extracts from fresh sea fish by paper chromatography. When the fish was stored for more than 6 days, the peptide disappeared. The following amino acids were identified on acid hydrolysis: glutamic acid, aspartic acid, glycine or serine, α-alanine, and a small amount of threonine.

Paper chromatographic studies of fresh and stored mussels, mytilus edulis.--A continuous increase in the concentration of leucine, isoleucine, valine, glutamic acid, aspartic acid, and α- and β-aminobutyric acids, was observed, after 3 to 8 days, in extracts of mussels that had been stored at 7° C. The contents of arginine and proline decreased to almost zero at 8 days, and subsequently increased.

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4.62

Table 2

Antioxidant	Time required to reach a peroxide value (Lea-value) of 25 at 25° C. (hours)	Protection factor
Concentration = 2×10^{-4}M . . (added by evaporation of 0.2 ml. of alcoholic solution and subsequent shaking with methyl linoleate in Warburg vessel)		$\frac{t_\alpha - t_\sigma}{t_\sigma}$†
Propyl gallate	18	2.0
3:5:3':4'-tetrahydroxy-7-methoxy-flavone (=rhamnetin) . .	45	6.5
3:7:3':4'-tetrahydroxyflavone	54	8.0
3:7:2':5'-tetrahydroxyflavone	93	14.5
3:2':5'-trihydroxy-7-η-butoxy-flavone	82	12.7
3:7:8:2':5-pentahydroxyflavone	290	47.3
3:7:8:2':3'-pentahydroxyflavone	40	5.7

† t_α = time quoted in previous column, t_σ = the corresponding time in the absence of antioxidant (t_σ = 6 hr.)

8.51

4.12

The enzyme, lipoxidase, was used to obtain information regarding the arrangement of double bonds in polyunsaturated fatty acids. Lipoxidase catalyzes only the oxidation of 1,4 diene systems. Fatty acids containing this arrangement of double bonds are oxidized and may be separated from the remainder of the fat by countercurrent extraction. By this procedure it was demonstrated that essentially all of the polyunsaturated fatty acids of menhaden oil were oxidized in the presence of lipoxidase. Analysis of the separated unoxidized fraction at various stages of partial oxidation showed that the enzyme catalyzed the oxidation of the 4, 5, and 6 double bond fatty acids indiscriminately.

Table 14 shows the lipoxidase assay of a number of common fish oils as compared with that of linoleic acid. It is thought probable that the findings on menhaden oil will be true for most fish and marine oils.

Table 14. Lipoxidase Assay of Fish Oil Fatty Acids

Fatty acids from	Iodine value Wijs	% 1,4-diene structure, compared to linoleic acid
Tuna oil, mixed species, refined	192.9	49.4
Tuna oil, mixed species, unrefined	190.5	14.15
Pilchard oil, 1954-55, pressed	208.0	28.20
Halibut liver oil	175.0	13.0
Dogfish liver oil, refined	108.0	6.35
Dogfish liver oil, unrefined	124.9	6.45
Shark, tiger, hammerhead, mixed	173.0	20.05
Menhaden oil	185.4	35.60
Alaska herring oil	149.1	24.20
Sockeye salmon oil, Puget Sound, 1955-	151.3	23.90

4.92

In 6 very similar experiments distillates of oxidized cottonseed oil or oxidized lard permitted good, although not quite optimum, growth when used as the only source of fat. None of these distillates had a protective effect against oxidized cottonseed oil. Undistilled oxidized cottonseed oil containing 40 percent polymeric "residue" and 60 percent "distillate" fraction led to rapid deterioration of animals, whereas a mixture of 40 percent polymeric residue and 60 percent fresh oil permitted acceptable growth.

When rats, by daily weighing and restricted feeding, are maintained within 3 grams of a constant weight their caloric requirements decline rapidly within the first few weeks if "good" diets are used. If the molecular distillate of the hydrogenated vegetable oil, which had been used for deep frying, was included in a diet as the only fat source and the animals were permitted to eat freely, the resulting growth was only slightly below that of animals fed fresh fat and the food intakes were similar. Caloric requirements of both groups declined steeply during the first 4 weeks of the experiment. The net energy value of the diet containing distillate was lower than that of the diet containing fresh fat, but the difference was not as pronounced as that between the groups fed polymeric residue and fresh fat. Ordinarily a chemically altered but essentially atoxic fat increases the animal's caloric requirement for weight maintenance.

Ten percent of a sample of oxidized lard that was atoxic to rats when included in a diet containing 30 percent casein led to rapid weight loss and death when fed in a diet containing only 5 percent casein. When 10 percent of the distillate was included in a diet with 5 percent casein, growth of the rats was similar to that of the controls receiving fresh fat. Liver, kidney and adrenal weights of rats fed distillate were within the normal spread for these organs and were only slightly higher than those of the controls, thereby supplying additional evidence for the low toxicity, if any, of these fractions.

6.130 FISHERY BYPRODUCTS RESEARCH

Anonymous
Commercial Fisheries Review 18, 8-11 (October 1956)

Experimental fish meal dryer.--A laboratory scale direct-heat dryer has been constructed at the Fish and Wildlife Service's Seattle Fishery Technological Laboratory. It will be used to prepare carefully controlled samples of fish meal for use in research on the nutritive value of fish meals.

The dryer consists of (1) a rotating inner drum with parallel vanes to distribute and tumble the meal while drying; (2) a stationary drum or housing to confine and direct the hot gasses around the rotating drum; (3) a nozzle-type gas burner as a heat source; and (4) accessories--drum motor, exhaust fan, thermocouples, and air ducts. The dryer is 60 inches long and 24 inches in diameter, with the inner rotating drum 30 inches long by 12 inches in diameter.

Press cake is dried in about an hour; four to five pounds of meal are dried per batch. The temperature within the dryer can be maintained at a predetermined setting within a range of about 3° F. The temperature is adjusted by manual manipulation of the gas flow by means of an indexed needle valve.

Experimental bulk ocean shipments of Alaska herring meal.--Bulk handling of herring meal has been suggested as a solution to the problem of the high cost of handling meal in sacks. This presents another serious problem, namely, the danger of spontaneous heating of the herring meal. Experiments recently conducted by a technologist from the Fishery Products Laboratory in Ketchikan indicate that the addition of an oil antioxidant to the meal as it leaves the dryer is effective in reducing the temperature rise of herring meals stored in confined areas.

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ABSTRACTER: Kathryn L. Osterhaug

6.14 CHANGES IN FAT EXTRACTABILITY AND PROTEIN DIGESTIBILITY IN FISH MEAL DURING STORAGE

Almquist, H. J.
Journal of Agricultural and Food Chemistry 4, 638-639 (July 1956)

Fish meals prepared by conventional methods from very fresh (hard) and from soft whole California sardines were analyzed periodically up to 331 days' storage at room temperature for solvent-extractable fat, protein, and pepsin-indigestible proteins. The extractability of the fat progressively decreased, whereas the pepsin-indigestible protein slowly increased. The latter also increased in samples from which the fat had been extracted initially. Little or no change was observed in sealed-in-glass samples. Oxidation is assumed to be responsible for the changes noted.

The results of the analyses of the stored fish meals is given in table 1.

See table, over.

(over)

ABSTRACTER: Kathryn L. Osterhaug

6.193 CONDENSED FISH SOLUBLES IN TURKEY RATIONS

Carter, R. D. and Wyne, J. W. (Ohio Agricultural Experiment Station, Wooster)
Ohio Farm and Home Research (November-December 1956)
Feedstuffs 29, 10 (January 12, 1957)

Dried brewers' yeast and condensed fish solubles are two sources of "unidentified growth factors", which are necessary for the growth of chickens and turkeys.

Purpose.--The study reported (see over) was conducted to learn if dried brewers' yeast and condensed fish solubles would improve the efficiency of a practical type turkey ration which contained adequate amounts of all of the known nutrients.

Experimental.--Approximately 30 male and 30 female large-type white turkey poults were placed into each of eight pens and maintained under heat lamp brooders on clean wood shavings litter. All poults received as a basal ration a conventional 26 percent protein starter ration during their first eight weeks and a 20 percent protein grower ration thereafter. The rations were fed to duplicate pens as follows: (1) basal ration, (2) basal ration plus 4 percent dried brewers' yeast, (3) basal ration plus 3 percent condensed fish solubles, and (4) basal ration plus 4 percent dried brewers' yeast and 3 percent condensed fish solubles. Protein levels were kept constant in all of the rations. Feed consumption records were maintained, and poults were weighed at 8 and 14 weeks of age.

Results.--The results of this test tabulated (see over) indicate that the addition of 3 percent condensed fish solubles to rations adequate in all known nutrients will improve the growth of turkeys at both 8 and 14 weeks of age. In this test, the addition of 4 percent brewers yeast did not significantly improve the weights of turkeys at eight weeks of age, but it did improve the weights of turkeys by the

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ABSTRACTER: Martin Heerdt

6.195 AMINO ACID IMBALANCE

Elvehjem, C. A. (Department of Biochemistry, University of Wisconsin, Madison, Wisconsin)
Federation Proceedings 15, 965-970 (September 1956)

The author demonstrated 3 types of amino acid imbalance by providing various levels of amino acids in the diets of rats.

To show that an increase of a given amino acid may precipitate a deficiency of the next most limiting amino acid, the author fed amino acids at the levels shown in table 1. It is apparent from the table that 18 percent casein supplies the accepted requirements for threonine, cystine, methionine, and tryptophan. When the level of casein, for example, is reduced to 9 percent, each of these amino acids is supplied at a level below the requirement and growth is reduced from 32 to 10 grams per week. These data demonstrate (1) a very sensitive balance between threonine and tryptophan and (2) the very small amount of each needed to cause a significant effect on growth. Nicotinic acid works as well as tryptophan to counteract the effect of threonine provided the diet contains at least 0.1 percent tryptophan. One milligram of nicotinic acid is equivalent to 50 milligrams of tryptophan under these conditions.

To show (1) that one amino acid may be antagonistic to another amino acid and (2) that as the intake of the first acid is increased the requirement for the other amino acid shows a corresponding increase, the author fed the levels of amino acids shown in table 4. When 3 percent L-leucine was added to a 9 percent casein diet, the rate of growth decreased significantly, whereas when 3 percent L-leucine was added to a 18 percent casein diet, a growth retardation was not observed. The extra level of casein supplies additional amounts of an amino acid which counteracts the increased levels of leucine. Further work has shown that the active amino acid is isoleucine and that the addition of 0.4 percent DL isoleucine will counteract approximately 1.5 percent of L-leucine. Other relationships are also shown in table 4. It is obvious that 9 percent casein supplies sufficient leucine and

(over)

ABSTRACTER: Martin Heerdt

6.14

Table 1. Analyses of Stored Fish Meals

	Sample Age, Days						
	4	42	64	120	164	241	331
	Percentage Composition, Dry Basis						
	Lot B Meal, Hard Fish						
Protein	70.7	69.5	69.3	69.3	69.6	69.4	69.4
Petroleum ether extract	6.8	4.7	3.3	2.4	2.3	2.2	2.3
Ethyl ether extract	7.1	6.1	4.1	2.7	2.7	2.7	2.7
Pepsin-indigestible protein	...	4.7	5.3	5.3	6.7	6.8	6.9
Indigestible protein as % of total protein	...	6.8	7.7	7.6	9.7	9.8	10.0
	Lot BX[a]						
Protein	...	76.0	74.5	74.5	74.5	74.0	73.5
Pepsin-indigestible protein	...	4.1	4.3	4.3	4.4	4.5	5.4
Indigestible protein as % of total protein	...	5.4	5.8	5.8	5.9	6.0	7.3
	Lot D Meal, Soft Fish						
Protein	75.5	75.9	75.9	76.0	76.0	76.0	76.0
Petroleum ether extract	...	2.6	2.5	1.9	1.8	1.8	1.7
Ethyl ether extract	6.5	4.9	3.6	3.0	3.0	3.0	2.9
Pepsin-indigestible protein	...	6.5	7.4	7.4	8.0	8.0	8.0
Indigestible protein as % of total protein	...	8.6	9.5	9.5	10.5	10.5	10.5
	Lot DX[a]						
Protein	...	83.9	83.6	83.4	83.4	83.4	83.4
Pepsin-indigestible protein	...	5.4	5.5	6.0	6.7	6.8	6.8
Indigestible protein as % of total protein	...	6.4	6.6	7.2	8.0	8.2	8.2

[a]Lots designated X are ether-extracted preparations from lots listed directly above.

6.130 (Cross Reference: 2.1127)

Antioxidants in fish meals.--Investigation has revealed that the effectiveness of a given antioxidant or mixture of antioxidants for protecting fish meals depends on how well it is mixed in with the meal. The antioxidants that have been studied so far are butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), diphenyl-paraphenylenediamine (DPPD), nordihydroguaiaretic acid (NDGA), and 1, 2-dihydro-2, 2, 4-trimethyl-6-ethoxyquinoline. Of these, the last appeared to be the most effective single antioxidant. Mixtures of the antioxidants appear to have an enhanced effect. At present, the use of DPPD for this purpose is prohibited by the Food and Drug Administration, pending further investigation of its physiological effects.

The choice of antioxidant or mixture of antioxidants is determined by the following criteria: (1) effectiveness in inhibiting oxidation; (2) adaptability to commercial processing conditions; (3) cost; and (4) toxicological properties and Federal approval.

Converting fish scales into animal food.--Contrary to general opinion, fish scales are digestible. Research performed cooperatively between the Fish and Wildlife Service and Georgetown University has proved that dried ground pollock scales are readily digested by rats used as experimental animals. A second study, being conducted at the University of Massachusetts, involves modification of the scales by chemical treatment before feeding to rats or chickens.

Salmon waste as bait.--Interest has grown recently in the use of selected portions of salmon waste for use as bait. Large quantities of chum salmon eggs are packaged for sale to sports fishing enthusiasts. This operation has been in existence for several years. A small industry has recently developed from the collection, packaging and freezing of pink salmon heads for use as bait in the commercial halibut fishery.

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isoleucine to meet the requirements, therefore the relationship is a true antagonism rather than a limiting amount of the second amino acid. Antagonisms also have been observed between phenylalanine, tryosine and threonine.

To show that a specific toxic effect may be produced the author cited the work of others. Sullivan, Hess and Sebrell (1932) reported growth inhibition and toxicity of glycine on a diet containing 4 percent casein fed at levels of 2½ to 20 percent of the diet. Hier, Graham, and Klein (1944) used both gelatin and casein diets and found significant growth inhibitions with 6 percent glycine, 5 percent DL-phenylalanine, or 5 percent L-proline. More recent work with glycine suggests that glycine is toxic, expecially since higher levels of folic acid seem to counteract this toxicity. The addition of 0.4 percent of methionine to a diet containing 18 percent casein causes a growth depression when vitamin B_6 is not supplied.

Table 1. Levels of amino acids on growth

Casein	Additions			Levels in Diet			Gain/week
	Threonine	Cystine and methionine	Tryptophan	Threonine	Cystine and methionine	Tryptophan	
%	%	%	%	%	%	%	gm
R				0.50	0.60	0.20	
18				0.68	0.54	0.22	32
9				0.34	0.27	0.11	10
9		0.2		0.34	0.47	0.11	12
9	0.04	0.2		0.38	0.47	0.11	4
9	0.04	0.2	0.1	0.38	0.47	0.21	19
9	0.20	0.2		0.54	0.47	0.11	3
9	0.20	0.2	0.1	0.54	0.47	0.21	23
9	0.2			0.54	0.27	0.11	12

R = Requirement.

Table 4. Levels of amino acids on growth

Casein	Additions			Levels in Diet			Gain/wk.
	Leucine	Isoleucine	Valine	Leucine	Isoleucine	Valine	
%	%	%	%	%	%	%	gm
R				0.8	0.5	0.7	
18				1.61	1.03	1.13	32
9				.80	.51	.56	18
9	3.0			3.80	.51	.56	4
9	3.0	0.4		3.80	0.91	.56	13
18	3.0			4.61	1.03	1.13	30
9	1.5			2.30	.51	.56	9
9	1.5	0.2		2.30	.71	.56	18
9	3.0	0.6		3.80	1.11	.56	8
9	3.0	0.6	0.6	3.80	1.11	1.16	15

R = Requirement

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14th week. The combination addition of brewers' yeast and fish solubles was no better than fish solubles alone. The amount of feed required to produce a pound of gain was essentially the same for all pens regardless of the ration fed.

Conclusions.--A growth response was obtained when condensed fish solubles was added to the basal ration which contained fish meal, therefore it appears that condensed fish solubles is a more reliable source of the "fish factor(s)," than fish meal. On the basis of their findings, the authors believe that dried brewers' yeast is of doubtful value if added to turkey rations that contain condensed fish solubles.

Ration	Average Weight		Feed Conversion		
	8 weeks	14 weeks	0-8 weeks	8-14 weeks	0-14 weeks
	pounds	pounds	pounds	pounds	pounds
Basal	3.1	8.3	2.3	3.4	3.0
Basal ration + 4% brewers' yeast	3.2	8.6	2.4	3.4	3.0
Basal ration + 3% fish solubles	3.4	9.1	2.4	3.5	3.0
Basal ration + 4% brewers' yeast + 3% fish solubles	3.3	8.9	2.5	3.5	3.0

6.195 AMINO ACIDS IN POULTRY NUTRITION

Kratzer, F. H. (University of California, Davis, California)
Feedstuffs 28, 12, 16, 78-79 (December 8, 1956)

This paper is a review of some of the more recent work in the field of amino acids that are likely to be in short supply in practical poultry rations.

Lysine.--With the rapid chick growth that is presently being obtained, the requirement for lysine is somewhat higher (1.1 percent) than was previously believed necessary. A relationship between energy and the requirement for lysine was demonstrated by Williams and Grau (1956). They added cellulose to a ration which contained a sub-optimal level of lysine and obtained improved chick growth because the cellulose reduced the available energy content of the ration and forced the chick to consume more feed. A larger feed intake in turn resulted in an increase in lysine consumption and this caused improved growth. A lysine deficiency in colored poults and chickens results in a lack of feather pigment formation in addition to retarded growth.

Poultry require lysine in keeping with the level of protein in their ration, but not in direct proportion to it. Poults during their first 4 weeks of life need 1.3 to 1.4 percent lysine or about 4.7 percent of their protein intake. After 4 weeks of age the lysine requirement drops to about 4 percent of the protein intake. Animal products in general are good sources of lysine provided the lysine, which is very susceptible to destruction in processing, has not been destroyed.

Methionine.--Baldini and Rosenberg (1955) showed that the methionine requirement increased with the energy content of the ration as was the case with lysine. Any reduction in feed consumption because of increased energy in the feed ration simply means that the smaller amount of feed must

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 ABSTRACTER: Martin Heerdt

6.73 AMBERGRIS AND GRISAMBROL

Anonymous
Drug and Cosmetic Industry 80, 100 (January 1957)

Autoxidation promotes the development of fragrance in tinctures of ambergris. This is accomplished by frequent shaking over a long period of time.

The starting point in ambergris research is the determination of the composition of its most important constituent, ambrein, which is present to the extent of 25 to 45 percent. Ambrein, a tricyclic triterpene alcohol, is a crystalline, practically oderless substance that is apparently the biogenetic parent substance of the aromatic principle in ambergris.

A tabulation has been made of research on ambergris and published in Helvetica Chimica Acta. L. Ruzicka identified ambrein as a doubly unsaturated tricyclic alcohol. E. Lederer and associates isolated a ketone from ambergris and obtained ambreinolide by the careful oxidation of ambrein with permanganate. Ruzicka et al. converted ambrein to a degradation product of manool, relating the structure of a triterpene to a diterpene. The same investigators also determined the exact position of the quaternary methyl group and clarified the structural formula for ambrein.

Hydrocarbon and oxygenated fractions were obtained by steam distillation of the ambrein mother liquor. A ketone-containing fraction consisted mainly of dihydro-δ-ionone which is also obtained by oxidizing ambrein with permanganate. The dihydro-δ-ionone has a typical ambergris odor, whereas the other isomers, α- and β-dihydroinone, have a woody, cedar-like odor.

The relationship between the ring systems of ambrein and the manool-sclareol group have been

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 ABSTRACTER: Kathryn L. Osterhaug

6.73 AMBERGRIS

Janistyn, Hugo
Drug and Cosmetic Industry 79, 322, 323, 394, 396 (September 1956)

Ambergris is a product of metabolism formed in the intestine of the sperm whale. It is not known whether it is formed pathologically or through the normal digestive process. "Body ambergris" is frequently found in the bodies of slain whales. It differs in odor and appearance from the best varieties used in perfumery. The water content of body ambergris is generally high, the consistency rather oily, and the odor fetid. Body ambergris can be used only after long aging.

Larger quantities for commercial use are obtained from the ambergris that is washed ashore. Ambergris from this source differs greatly in both color and odor. The color varies from a dirty white to a blackish brown. Although the lighter colored specimens are especially prized, the darker colored ambergris can also be used for its odor. The best commercial qualities are known as "gray amber" (ambre gris). It is highly soluble in 95 percent alcohol; the residue amounts to 10 percent at most and in good lots is powdery and brown-colored after drying.

Ambergris is used in the perfume industry. Properly processed gray amber is particularly valuable in perfumery and has a unique effect.

"The complex scent of genuine ambergris is composed of these few clearly discernible notes: (1) the odor of seaweed exposed to sunlight, and thus of seawater itself; (2) the fragrance of wood and damp earth, but without a musty effect; (3) the scent of fine tobacco; (4) a slightly fetid tang which, however, is not conspicuous in the good kinds; and (5) a musk-like scent, varying in strength, that blends in rather like an undertone.

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 ABSTRACTER: Kathryn L. Osterhaug

7.50 THE EFFECT OF VARIOUS DRYING METHODS ON THE NITROGEN AND FAT CONTENTS OF BIOLOGICAL MATERIALS

Watts, Johnnie H.; Booker, Lovie K.; Wright, Walter G.; and Williams, E. Geraldine (Tuskegee Institute, Alabama)
Food Research 21, 528-533 (September-October 1956)

Purpose.--A study was made (1) to learn if an appreciable amount of nitrogen and volatile fatty acids are lost when biological materials are dried at their natural pH and (2) to compare ordinary methods of drying for their effect on nitrogen and fat.

Experimental.--The foods studied were ground beef, homogenized cow's milk, and whole eggs. Six weighed samples of each kind of food were put on dishes in an air oven at 80° C., in a vacuum oven at 61° C., and in the path of infrared rays at an average of 51° C. Three samples of each kind of food were lyophilized in flasks at -75° C. and 150 microns pressure. All samples were dried until two successive weighings agreed within 2 milligrams, ground, bottled, stored at -29° C., and analyzed within 3 months.

Methods of analysis.--Total nitrogen was determined by the Kjeldahl method. Total fat was determined by the Mojonnier method as modified by Calloway (1953) and reported as method CQD II M.

Results.--Averages of duplicate determinations in table 1 (see over) show that approximately similar amounts of water were removed from whole egg and ground beef by all four methods of drying. A second lot of ground beef and homogenized milk (third sample) was used for freeze-drying, therefore the assays are not directly comparable. Table 1 also reports protein and total fat, whereas table 2 reports the mean percent of nitrogen and fat retained after drying. Statistically no difference

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 ABSTRACTER: Martin Heerdt

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The peculiar note of genuine ambergris led to the development of many substitutes, known as "ambergris compositions" and "ambergris bases", whose suitability for perfumery varies. The foundations of most of the better known ambergris bases or compositions are labdanum and clary. Although of value, these compounds could never quite replace genuine ambergris in its effect.

In the last few years, chemists in Switzerland, France and Germany have succeeded in synthesizing most of these ambergris principles and producing an ambergris product with the character of true ambergris. The German product, Ambropur, contains the natural note of gray ambergris with enormous perfume strength..

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was found at the 1 percent level in the amount of nitrogen and fat retained in egg, ground beef, and whole milk on drying by the air oven, vacuum oven, infrared rays, or lyophilizer.

Table 1.--Per cent moisture, protein, and fat in three foods before and after drying by four methods

Sample	Moisture			Protein[1]			Total fat[1]		
	Egg	Beef	Milk	Egg[2]	Beef[2]	Milk[3]	Egg	Beef	Milk
	%	%	%	%	%	%	%	%	%
Fresh				12.07	23.54 21.54[4]	3.50 3.71[4]	10.43	6.93 11.54[4]	3.76 3.76[4]
Air oven-dried: Av.	73.6	68.1	86.9	12.09	23.26	3.37	11.05	8.21	4.08
Vacuum oven-dried: Av.	73.2	67.7	86.9	12.02	22.32	3.26	11.23	8.17	4.24
Infrared-dried: Av.	73.9	66.4	87.3	12.02	22.09	3.30	10.43	10.73	4.20
Lyophilized: Av.	73.8	59.6[4]	86.0[4]	12.37	25.91[4]	3.42	11.20	11.50[4]	4.07[4]

[1] As determined by analyzing the dried food and using "per cent moisture" in each case for converting to fresh weight basis, i.e., egg sample No. 1, air oven-dried, contained 72.4% water; on analysis for total nitrogen, the dried sample contained 7.25% nitrogen: % protein on fresh weight basis=7.25 x $\frac{(100.0-72.4)}{100}$=12.50; [2] total N x 6.25; [3] total N x 6.38; [4] these analyses were done on a second lot of the food.

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contain more methionine to meet the needs of the chick. The same relationship probably applies to other amino acids as well, whenever rations with increased energy are to be used. Pepper and Slinger (1955) reported an increase in the growth of poults from 0 to 8 weeks of age by the addition of methionine to a basal ration containing 0.43 percent methionine. The methionine requirement after 8 weeks was relatively constant at 1.47 to 1.48 percent of the protein intake. Almquist (1956), in contrast, reported that the methionine requirement expressed as a percentage of the protein in the ration, continued to increase with the age of the turkeys after the initial 8 weeks growing period.

Tryptophan.--Tryptophan is important as a precursor of niacin, however the quantitative importance of this relationship is not known. According to Fisher et al. (1954) tryptophan can spare the need for niacin in the diet of the chick, but niacin cannot spare the need for tryptophan. Patterson et al. (1956) have shown that the niacin requirement of the chick varied from a low of 8 or 9 milligrams (mg.) to 13 or 15 mg. per pound of ration as the tryptophan content of the ration varied from 0.24 to 0.14 percent. Tryptophan could compensate successfully for a partial niacin deficiency. Chicks required more tryptophan at a decreasing rate as the protein level of their ration was increased.

Arginine.--Fisher, Salander, and Taylor (1956) were able to obtain very little response in the growth of chicks on supplemental creatine as compared to the response in growth obtained with glycine and arginine. Further study is needed to determine the amount of arginine which is normally used in creatine synthesis and to learn if creatine may spare arginine in practical rations.

Glycine.--Part of the requirement for glycine in the diet of the chick may be fulfilled by serine according to evidence presented by Wixom, Pipkin, and Day (1955). Glycine at high levels is toxic to chickens, but this toxicity may be alleviated by folic acid according to Totter, Kelley, Day, and Edwards (1950). Four percent glycine in a poult ration depressed growth severely in the absence of folic acid, whereas the addition of folic acid to the diet completely prevented growth depression.

6.73 (Cross Reference: 8.59)

clarified. Ruzicka et al. (1949) partially synthesized the hydrocarbon ambratriene obtained from ambrein by splitting off water. Stoll and Hinder (1950) demonstrated the relationship of sclareol to the odoriferous substances of ambergris and the constitution of sclareol was clarified by several groups of workers. Sclareol is the essential component of clary and has a weak odor of ambergris. Ozonizing of sclareol gave bicyclohomofarnesal, bicyclohomofarnesol and a hydroaromatic epoxide.

From this and additional research, a synthetic product, "Grisambrol" has been developed for use in perfume.

1.1 FEEDING MACKEREL AND HERRING TO MINK KITS

Nielsen, K. Hovgaard
Dansk Pelsdyraul 18, 223-225 (June 1955)

(Abstract of this article appears under 6.52 page 15 - January 1957)

1.1 IRON SULFIDE DISCOLORATION OF TUNA CANS NO. 3 - EFFECT OF VARIABLES INTRODUCED BY THE FISH

Pigott, George M. and Stansby, M. E.
Commercial Fisheries Review 18, 8-12 (June 1956)

(Abstract of this article appears under 3.33 page 13 - January 1957)

1.1 TUNA VISCERA TO FORTIFY CONDENSED SOLUBLES

Anonymous
Pacific Fisherman 54, 16, 19, 21 (June 1956)

(Abstract of this article appears under 6.15 page 19 - February 1957)

2.01 THE OXIDATION OF PROPIONIC ACID BY A MARINE BACTERIUM

Tomlinson, N. and MacLeod, R. A. (Fisheries Research Board of Canada, Pacific Fisheries Experimental Station, Vancouver, B. C. (Canada))
Biochim. Biophysics Acta 18, 570-571 (1955) (Reprinted)
Studies 1955 from the Stations of the Fisheries Research Board of Canada, FRB No. 421 (1956)

A bacteria of marine origin tentatively identified as a species of Mycoplana was found to exhibit unusual behaviour in its oxidation of propionic acid.

2.01 SPOILAGE OF FISH IN THE VESSELS AT SEA 2. TREATMENT ON THE DECK AND IN THE HOLD

Castell, C. H.; MacCallum, W. A.; and Power, H. E.
Journal of the Fisheries Research Board of Canada 13, 21-39 (January 1956)

(Abstract of this article appears under 2.15 page 5 - October 1956)

2.01 SPOILAGE OF FISH IN THE VESSELS AT SEA 3. THE VALUE OF NITRITE ICE AND NITRITE DIPS FOR THE PRESERVATION OF GUTTED FISH IN THE HOLD OF THE VESSEL

Castell, C. H. and Gunnarsson, G. K.
Journal of the Fisheries Research Board of Canada 13, 207-218 (March 1956)

(Abstract of this article appears under 3.12 page 7 - November 1956)

2.1121 B. C. SHRIMP INDUSTRY

Anonymous
Trade News 8, 3-4 (June 1956)

(Abstract of this article appears under 1.85 page 1 - February 1957)

2.1121 ON THE DEEP-SEA DRAG-NET FISHERY ON THE PACIFIC COAST OF MIDDLE JAPAN, ESPECIALLY ON THE NEW GROUND

Hanyu, Isao; Tamura, Tamotsu; Amemiya, Ikusaku; Hutamura, Kazuo; Huziki, Susumu; and Yosida, Noriyuki
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 9, 982-990 (1956)

The average daily catch per boat on new ground was much superior to that on old grounds at present and even superior to that on old grounds after World War II.

2.1124 MODEL EXPERIMENTS ON A SAURY BLANKET NET (BOUKE-AMI)---I.

Pack, Yongjun
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 9, 978-981 (1956)

The sweeping volume of the net seems to be larger with the weight of sinkers if the lifting speed is kept constant.

3.12 EXPERTS SEE 4-WAY FUTURE FOR ANTIBIOTIC AGENTS

Anonymous
Food Engineering 28, 56, 179-180 (December 1956)

At the recent Fourth Annual Symposium on antibiotics held in Washington, D. C., striking extensions of freshness were reported for poultry, meats, seafood, and vegetables. Complementary actions of irradiation and antibiotics in prolonging the shelf-life of refrigerated, prepacked red meats were also discussed.

3.12 SHOULD ANTIBIOTICS BE USED AS FOOD PRESERVATIVES? AMERICAN EXPERIENCE AS A GUIDE

Barnes, Ella M.
Food Manufacture 31, 508-510 (December 1, 1956)

3.12 PRESERVATION OF SHRIMP

U. S. Patent 2,758,929 (August 14, 1956)
Food Engineering 29, 164 (January 1957)

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Archives of Biochemistry and Biophysics
Biochemical Journal
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
Canner and Freezer
Chemical Abstracts
Chemical and Engineering News
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Federation Proceedings
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Feedstuffs
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Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
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Food Preservation Quarterly
Food Processing
Food Research
Food Science Abstracts
Food Technology
Frosted Food Field
Gourmet
Industrial and Engineering Chemistry
Industrial Refrigeration
Institutions
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Pan American Fisherman
Poultry Science
Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

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Editorial Clerk (Typist)--Gladys K. Chandler

3.237 HOUSEHOLD CONSUMER PREFERENCES FOR BREADED SHRIMP AND BREADED FISH STICKS

Kahn, Richard A. and Stolting, Walter H.
Fishery Leaflet 425 (September 1955)

(Abstract of this article appears under 3.236 page 11 - February 1957)

3.237 BONE DETECTION IN FISH BY X-RAY EXAMINATION

Frascatore, Anthony J. Jr. and Holston, J. A.
Commercial Fisheries Review 17, 1-11 (November 1955)

(Abstract of this article appears under 7.73 page 13 - July 1956)

3.237 REFRIGERATION OF FISH - PART 4 - PREPARATION, FREEZING, AND COLD STORAGE OF FISH, SHELLFISH, AND PRECOOKED FISHERY PRODUCTS

Dassow, John A.; Pottinger, S. R.; and Holston, John
Fishery Leaflet 430 (1956)

(Abstract of this article appears under 3.23 page 7 - December 1956)

4.00 22ND ANNUAL REVIEW OF THE LITERATURE ON FATS, OILS, AND DETERGENTS. I.

Piskur, M. M. (Swift and Company, Chicago 9, Illinois)
The Journal of the American Oil Chemists' Society 33, 203-218 (May 1956)

4.11 FATTY ACIDS COMPOSITION OF SAURY OIL BY SPECTROPHOTOMETRIC METHOD

Tsuchiya, Yasuhiko and Kayama, Mitsu (Department of Fisheries Faculty of Agriculture, Tohoku University, Sendai, Japan)
The Tohoku Journal of Agricultural Research 5, No. 4, 269-276 (March 1955) (Japan) (In English)

The problems of the assumptions arisen from applying the spectrophotometric method to the marine oils are discussed.

4.11 PAPER CHROMATOGRAPHY WITH CONTINUOUS CHANGE IN SOLVENT COMPOSITION PART I. SEPARATION OF FATTY ACIDS

Franks, F.
The Analyst 81, 384-390 (July 1956)

A method and apparatus described permit paper partition chromatography to be carried out with a solvent whose composition changes continuously in an exponential manner. The method is preferred to more conventional procedures, because closely similar compounds such as members of a homologous series can be separated on a short paper strip, thus avoiding diffusiveness of zones.

4.12 ORIGIN OF THE CHARACTERISTICS OF THE FATS OF FISH

Lovern, J. A. (Torry Research Station, Aberdeen, Scotland)
Fette u. Seifen 55, 425-30 (1953)
Chemical Abstracts 50, 7335 (May 25, 1956)

4.14 NUTRITIVE VALUE OF WHALE OIL

Fujii, Hisashi; Okura, Shunichi; and Mori, Mikio (Japan Marine Products Co., Odawara)
Repts. Japan Marine Products Co. Research Lab. No. 7, 18-22, 23-27, 28-30 (1956)
Chemical Abstracts 50, 12330 (September 10, 1956)

IV. The nutritive values of whale oil, oil hydrogenated with Cu and Ni as catalysts, resp., and the methyl esters of each were compared.
V. Seborrhea caused by sperm whale oil and oxidized soya oil.
VI. Nutritive value of hydrogenated whale oil with added essential fatty acid ester.

4.62 APPLICATION OF ANTIOXIDANTS TO "SHIOKARA"

Fukuda, Hironari
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 8, 934-936 (1955) (English abstract and figures)

Oil rich fish guts are usable for the raw material used in making "Shiokara" after the addition of an antioxidant, such as Sustane.

4.62 A NEW DEVELOPMENT IN FISH MEAL PROCESSING

Meade, Thomas L.
Feedstuffs 28, 14, 16, 121-122 (May 19, 1956)

(Abstract of this article appears under 6.14 page 17 - January 1957)

4.62 ANTIOXIDANTS PRESENT STATUS

Couch, J. R.
Feedstuffs 28, 32-34 (May 19, 1956)

(Abstract of this article appears under 4.60 page 17 - January 1957)

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A new sterol, 24-methylenecholesterol, has been isolated by a chromatographic separation of the azoyl esters prepared from the sterols of the oyster (Ostrea gigas) and the clam (Saxidomus giganteus). Oyster and clam sterols contain 36 and 53 percent respectively, of this sterol.

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Braekkan, Olaf R.
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8.7 DETERMINATION OF QUALITY OF SEA MUSSELS AND OYSTERS

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To assess the quality of mussels or oysters, 2 determinations are required: (1) the volume of the bivalve contents, and (2) the dry weight of organic matter in the flesh. On this basis, a formula is proposed whereby the quality coefficient equals 100 x the ratio of the dry weight of flesh (in g) to the volume of the bivalve contents (in cu. cm).

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